ENGINEERING AND MINING JOURNAL

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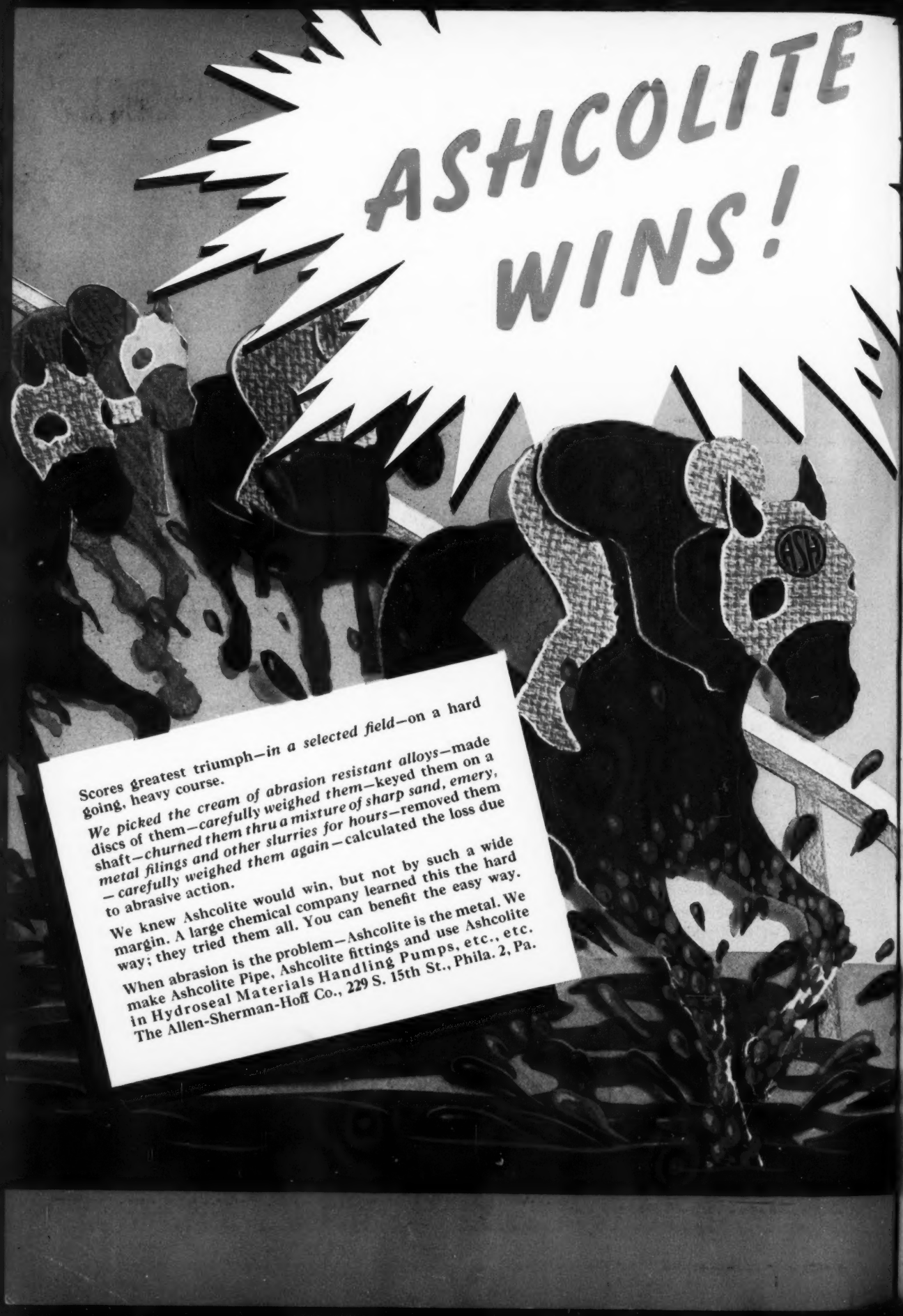
OCTOBER, 1947

Two-way shaft communication by carrier-current signaling between cager and hoistman in Homestake mine

Deep-Mining Possibilities in the Coeur d'Alenes—Page 70



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ENGINEERING AND MINING JOURNAL

OCTOBER, 1947

Let's Tackle Industrial Relations Aggressively

WESTERN MINING, in our opinion, is confronted with a very serious labor problem, so serious indeed that we think it cannot afford to fall back on the philosophy that conditions will cure themselves in the fullness of time. We fear that the cure likely to result from such a policy may be worse than the disease.

For several months the news of labor conditions in Western mining has been disturbing. The fact that only a portion of the manpower losses suffered during the war has been recouped is all too evident.

Observing that the situation in manufacturing industry, both as to labor supply and efficiency, was much better than in Western mining, and fearing that operators were assuming that causes were beyond their control, the editor made an investigation of the manpower picture his principal concern on a recent ten-week Western trip.

The actual situation observed was considerably worse than anticipated, and genuinely alarming. Virtually all Western mines and smelters are so seriously short of manpower that, even if their workmen were individually very efficient, costs would still be high. Moreover, personal efficiency of new employees is conspicuously low, turnover is fantastically high, interest in the job is slight, and ambition to buckle down and acquire skill is to a large extent lacking. Many mining companies are spending substantial sums to train green men and virtually all who do so are not getting the investments back before the men quit and go elsewhere. A considerable portion of the younger men seem to be confused as to their objectives; many don't want hard work, and are simply looking for the easiest way to earn the most money. Many of the drifters are unappreciative of attempts to provide housing or other comforts, and proceed to wreck whatever accommodations are furnished. Unfortunately, where a good workman does turn up, a lack of available housing for his family often causes him to move on in a few weeks.

As a result, operators are exercising all their talents simply to keep mines going, and throw up their hands in despair when one asks about efficiency. Many of them feel that the wear and tear on facilities furnished is so great that further investments are hardly justified. The general belief is that little can be done by individual effort to effect a cure and that mining must simply await the time when unemployment makes men more anxious to hold a job.

The situation is complicated by the circumstance that collective bargaining in recent years has reduced percentagewise the differentials in favor of both skilled and underground work. The most exhaustive practical efforts can hardly expect to make underground work as easy, safe and comfortable as surface work. We regard it as vital that the industry must preserve adequate differentials for skilled and underground employment and must resist the tendency of unions to level out wage scales.

Another circumstance that has put a great many operators "between a rock and a hard place" is the bargaining technique adopted by the unions of dealing first with the operators best able to pay. In a labor-shortage period the operator less able to pay is faced with the necessity of meeting the scale established or being forced to close down.

Probably we must recognize that the peculiar apathy of many younger workmen toward self-improvement in the good old fashioned way, and their indifference toward the success of the enterprise are not solely the result of anti-employer propaganda and the something-for-nothing philosophy espoused by the New Deal. The evidence is overwhelming that, important as these domestic influences have certainly been, we are in the midst of a world-wide recession in morale that does not seem to make sense but nevertheless exists. The failure of several European countries to pull themselves together and make an earnest start down the road to economic recovery and political stability cannot be ignored. The willingness of British coal miners to place their country in jeopardy as serious as any wartime emergency is part of the same picture. In the regional news pages of this issue, reports that have been received from Australia, Bolivia, Chile, and Mexico indicate a de-

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generacy of labor morale that is simply appalling.

Despite the views of many men in the industry for whom we have the greatest admiration and respect, we cannot adhere to the idea that we should look for this situation to cure itself through natural and inevitable economic reactions. In fact, this attitude fills us with forebodings. We believe that there are new elements in the picture which must be recognized, and that, considering the background, general adversity is more likely to produce a broad demand for Government controls than chastened spirits and a desire to do things the hard, constructive way.

The new elements which we believe deserve recognition are:

1. The hard-boiled tradition is virtually dead. It is no longer possible to assemble working forces that take great pride in doing hard or hazardous work. Workmen expect machinery to do the back-breaking jobs.

2. People are more concerned with leisure and recreation than formerly. The automobile, radio and other modern facilities have made it possible to utilize time off to better advantage.

3. The kind of men who are necessary to efficient operation of a highly mechanized industry are becoming more and more discriminating over comfort, safety, community advantages, housing, and education.

4. Diversified industry is moving into the West. Competition for the better kind of workman is keener and will be more so.

5. The average workman is not enthusiastic about his employer or his job. Several years of anti-employer propaganda on the part of unions and the New Deal have opened a serious breach which will take much earnest, painstaking work to close. Progressive manufacturers are doing a better repair job than the mining industry.

We do not pretend to have all the answers to this problem. We doubt that anyone has. Nevertheless, we insist that it would be a mistake to wait for conditions to cure themselves. We are sure that, whatsoever the outcome, those operators will profit most who will subject established practices to the most searching self-criticism, taking nothing for granted. We urge the most earnest attention to doing what is possible within necessary economic limits toward making mining communities more attractive, toward improving the safety and comfort of working places, toward new strides in mechanization and efficiency, and toward the establishment of adequate differentials for arduous, underground, and skilled work. The possibility of further application of incentive wages based on productivity should be explored.

Last but far from least, we insist that the present situation calls for much more than simply being on the level with employees. In this day and age a good product must still be sold. Considering the pressures that are being applied against them, employers must take positive steps to restore mutual confidence between the individual workman and management; also, to build up the pride of workers in the job and their own parts in its accomplishment.

Politics Tarnishes the Bureau Directorship

IN RECENT YEARS it has become a real problem to persuade outstanding industrialists or technical men to undertake Government service. In addition to the indignities which Washington customarily heaps upon candidates for appointive positions, the Bureau of Mines directorship has been placed in an unfortunate light by the shabby treatment accorded two former directors, Scott Turner and John W. Finch. The way in which the appointment of Col. James Boyd has been handled does nothing to improve the situation. If Col. Boyd's appointment should finally be rejected by the Senate, it will be next to impossible to find a capable outsider willing to run the gauntlet.

People who know Col. Boyd think he will make a capable director, and will be effective in restoring the prestige which the Bureau has lost in recent years. He grew up in the mining industry and was technically educated for it. After distinguished service in the military occupation of Germany, where administration of all mineral problems was entrusted to him by the high command, the Colorado School of Mines, where he had served for several years, honored him by appointing him dean of the faculty.

His choice as Bureau head was strictly nonpolitical. Secretary Krug had met him in War Production Board days and had grown to respect his ability. After some months of persuasion, Krug finally induced Boyd to accept the Bureau appointment.

About the time of the Centralia coal mine disaster the Boyd appointment was being considered by the Senate. Burning with a desire to revenge himself for the whipping Krug had given him in the coal walkout, John L. Lewis opposed the appointment on the grounds that the candidate lacked experience in coal-mine safety.

The weakness of Lewis' case was obvious. Acknowledging the importance of coal-mine safety, the activities of the Bureau today are so diverse that no single individual can offer important background in all its functions. The directorship calls for a man who has a broad understanding of min-

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ing problems, preferably a technical man, but above all a capable and courageous administrator. Boyd has these qualities. We believe it would be a serious error for the Administration to fail to give him its fullest support, or for the Senate to countenance Lewis' unfair attack.

Taconite Plants vs. Coastal Steel Plants

MARVIN BARLOON, professor of business and economics at Western Reserve University in Cleveland, writing in August *Harper's* in a noteworthy article entitled "Steel: The Great Retreat," has done what he can to upset the complacency of those who think that in the taconite reserves of the Mesabi lies the answer to the problem of providing a new ore supply to take the place of the Mesabi ores now worked, as these approach exhaustion. Noting the present beginnings of the taconite movement, he forecasts that within five years it will be providing 5% or more of Lake Superior shipments. He thinks, however, that the rigidity of cost will retard the growth of taconite processing beyond the minimum requirements of the Pittsburgh and Gary regions, and that in time of great need the steel and mining executives will "prefer to backlog orders rather than spend additional millions providing new facilities for an uncertain future."

In the meantime, the high cost of ore for the Mid-Western steel industry will make it more vulnerable to competition from plants on the Atlantic Coast supplied by foreign ores. The result, says Prof. Barloon, will be inevitable. Much of the steel industry will find itself on the move to the Atlantic and Gulf Coasts. Even apart from the coming depletion of the Mesabi Range, he adds, the steel companies have good reason to plan new plants on these coasts.

Prof. Barloon's outlook is essentially a long-term view. The migration of our steel industry to the coast, with the accompanying dislocation of the important industries dependent on it, could hardly take place but slowly—very slowly, all factors considered. On the other hand, the interests involved in the taconite movement are much concerned about a continuing supply of ore, especially in time of war, and they fear that shortages will begin at a fairly early date and become progressively worse. We doubt if many operators today are letting their thoughts run beyond the end of the present century, if that far. Likewise we doubt that the transplanting of the steel industry prophesied by Prof. Barloon will materialize to more than a limited extent in the same period.

It seems likely that a coastal steel industry will grow gradually, as foreign resources become accessible, at the same time that taconite plants increase in size and multiply. Perhaps a point will be reached where the two movements will be balanced. Too many factors are involved to hazard a guess. For one thing, it is interesting to note that the discussion puts emphasis on coastal iron and steel plants at a time when thoughts are being directed in general toward moving industry inland and underground. Nobody as yet clearly sees what atomic warfare's possibilities will dictate.

ECPD Completes Its Fifteenth Year

CONGRATULATIONS are due the Engineers' Council for Professional Development upon the fifteenth anniversary of its organization in October, 1932. Sponsored by the principal national engineering societies in the United States and the Engineering Institute of Canada, for the purpose of raising the status of the engineer, individually and collectively, it has cooperated with these bodies in an effort to improve the selection, education and post-college training of young men entering the profession, and to devise methods of recognizing the attainments of engineers. Its work in the accrediting of engineering curricula and in student selection and guidance it cites as major accomplishments.

Opportunity for engineering employment at home and abroad has been a matter of study. According to the American Society for Engineering Education, 90,000 men must be graduated between 1946 and 1950 to meet the accumulated need. Under present world conditions, the foreign outlook hardly permits a corresponding estimate.

ECPD has done meritorious work in devising a program whereby misfits can be deterred from entering engineering and those that do enter will be better prepared for engineering employment upon completion of their studies. To further its prime objective of raising the status of the engineer, ECPD should seek to convince the industries it thus indirectly serves that the engineer must be adequately remunerated if he is to serve his employer well. Otherwise, expressions such as "improved status" will be but hollow words.

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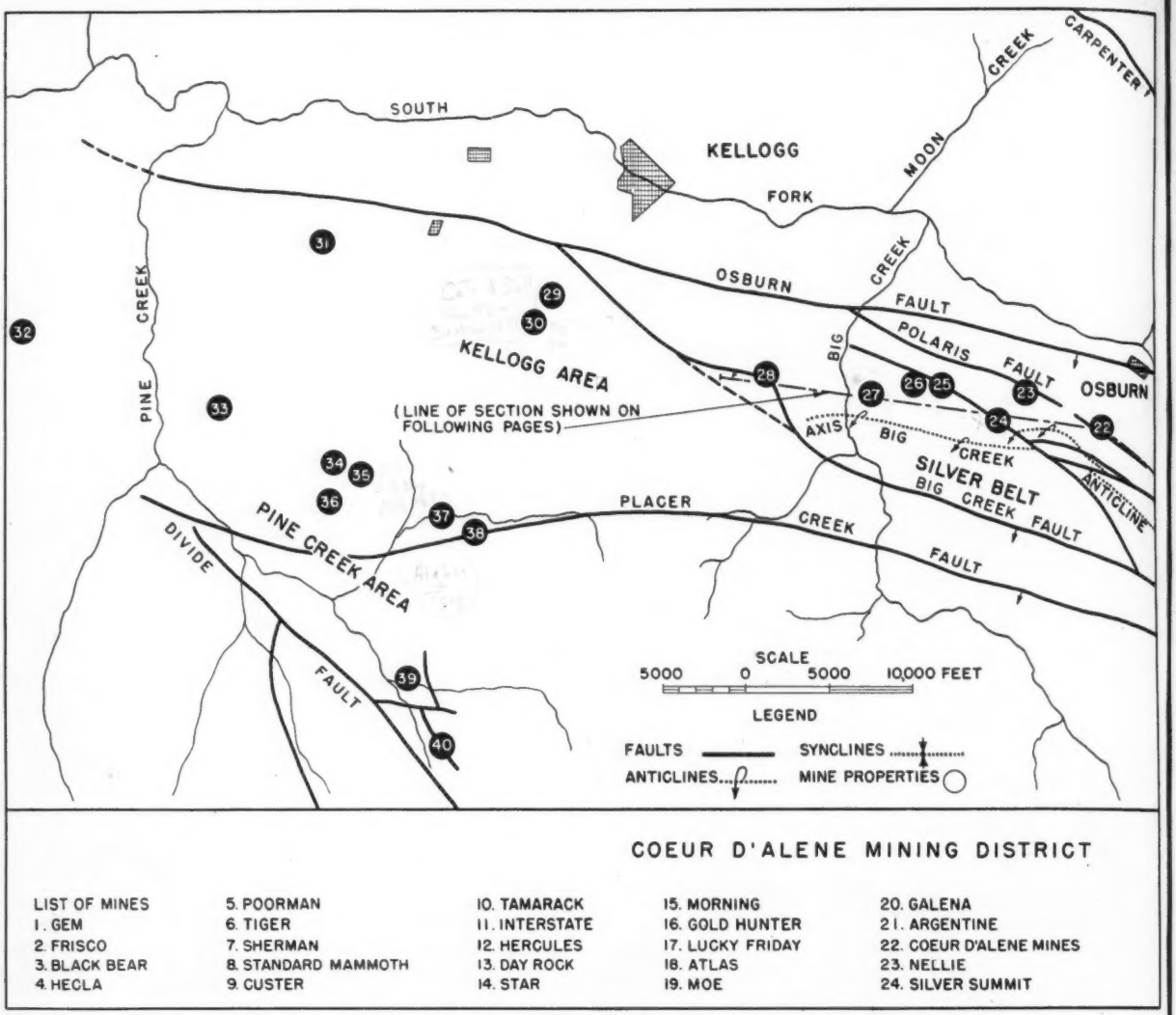


Deep Discoveries Intensify

ROBERT E. SORENSON
Geologist, Hecla Mining Co., Wallace, Idaho*

THE MEASURE of the real worth of a mining district is its ability to sustain a continued and expanding production of metal over a long period of time. In Idaho we have such a district, one of the outstanding mining districts of the world, known as the Coeur d'Alene. A few years ago it passed the billion-dollar mark in value of output of metal, thereby becoming one of the eight mining districts of the world which have produced more than a billion dollars worth of metal.

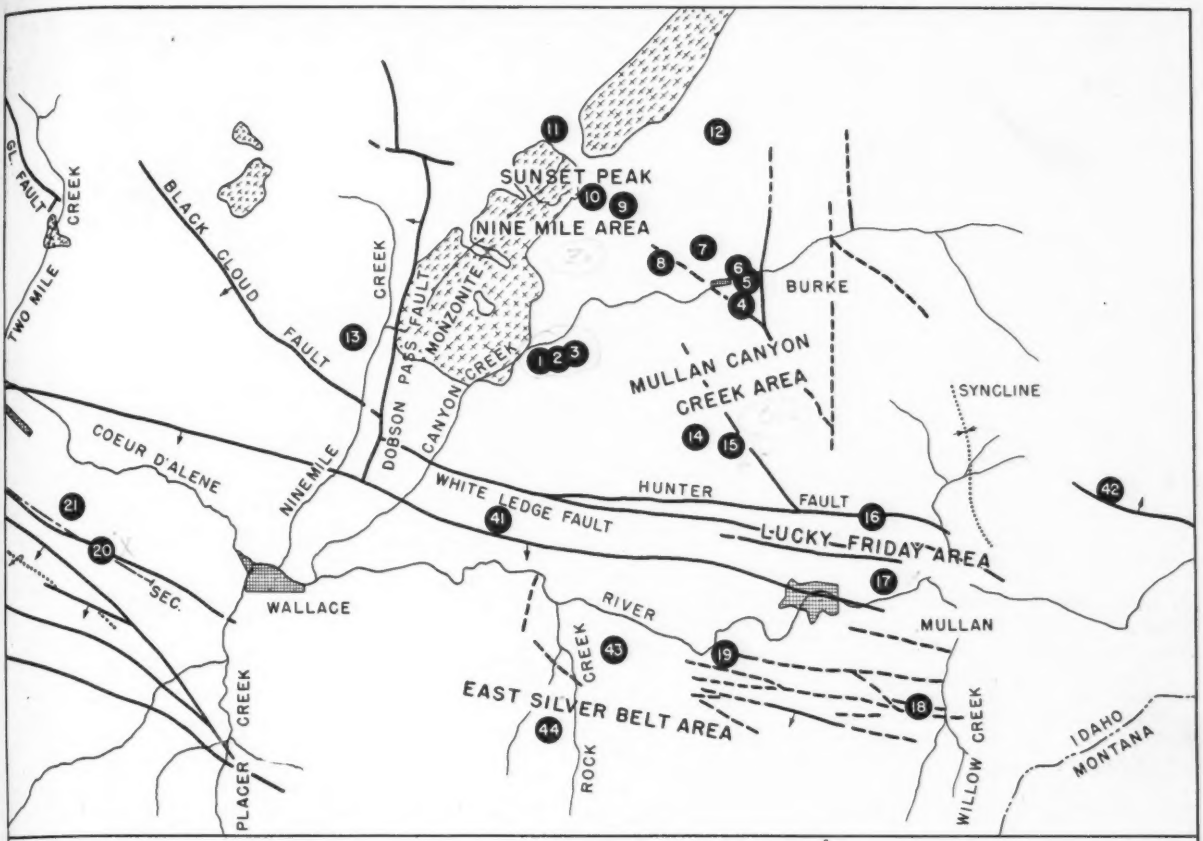
In 1879, gold was discovered on Prichard Creek in the Murray District, and active lode and placer mining began in 1883. Prospectors from the gold camp drifted into the adjoining mountains during the next two years and there discovered many of the lead-zinc-silver veins near Burke, Mullan and Kellogg.

In addition to the outcropping orebodies, many hidden orebodies were covered by locations of the period, and active development of many properties was begun. By 1903 the district was one of the outstanding lead-producing districts of the world, and since that time it has been a very important producer of lead, zinc and silver.

The principal rocks exposed in the area are argillite and quartzite with many intermediate types grading from slate to quartzite. All of the rocks are part of the Belt series of Pre-Cambrian sediments which have a widespread exposure in western Montana, Northern Idaho, eastern Washington and southern British Columbia.

The Belt series, in the Coeur d'Alene District, consists of more than 20,000 feet of sediments of shallow-water origin subdivided, for means of identification and correlation, into the following formations, the oldest named first:

*Condensed from a paper read before the Idaho Mining Association, May 23, 1947.



SHOWING MINES AND MAJOR FAULTS

25. CHESTER	30. BUNKER HILL	35. SIDNEY	40. CONSTITUTION
26. POLARIS	31. PAGE	36. PITTSBURG	41. GOLCONDA
27. SUNSHINE	32. HYPOTHEEK	37. NEVADA STEWART	42. SNOWSTORM
28. CRESCENT	33. LIBERAL KING	38. HIGHLAND SURPRISE	43. GEM STATE
29. LAST CHANCE	34. DENVER	39. DOUGLAS	44. ROCK CREEK

Coeur d'Alene Activities

1. The Prichard Formation consists of dark gray to black argillite and argillaceous quartzite. Its thickness is more than 12,000 ft.

2. The Burke Formation is composed of 1,800 to 2,400 ft.[3] of gray to white quartzite and argillaceous quartzite.

3. The Revett Formation varies in thickness between 2,100 and 3,400 ft.,[3] and consists of massive, thick-bedded, gray to white, quartzite with a minor development of argillaceous quartzite.

4. The St. Regis Formation is composed of thin-bedded, purplish to purplish-gray, argillite and quartzite. Thickness varies from 1,000 ft. to 1,400 ft. in some areas.

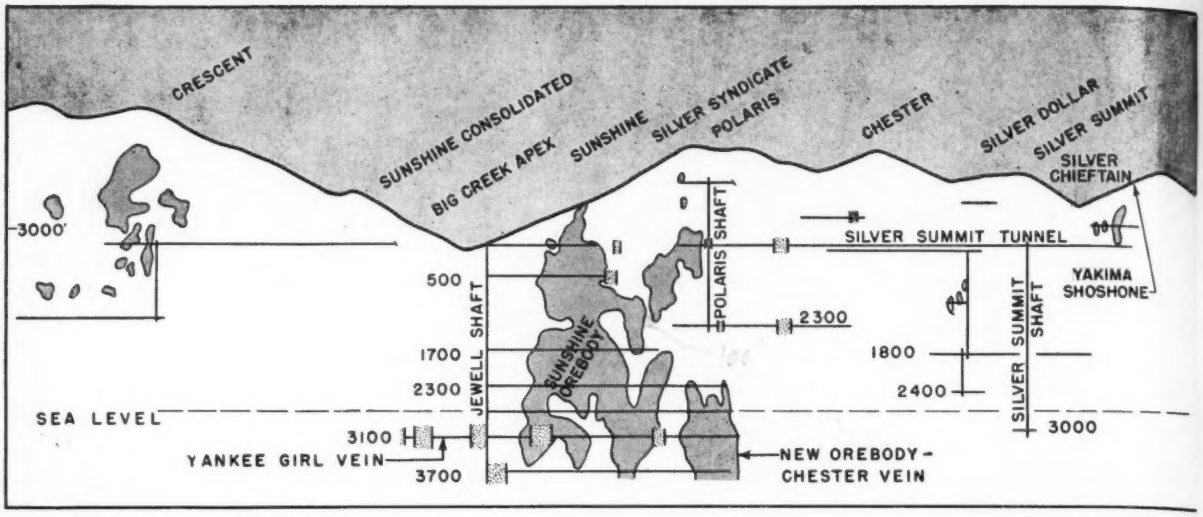
5. The Wallace Formation is 4,500 to 6,000 ft. in thickness and consists of gray to white calcareous quartzite, and gray to black calcareous argillite.

6. The Striped Peak Formation consists of 1,500 ft. or more of purplish, pink, and green quartzite, sandy quartzite, and calcareous argillite. Its exposure in the district is limited to small areas.

Intrusive rocks include the monzonite and syenite shown in the accompanying plan map as small cupolas cutting the sediments. Geologists believe that the magma which produced these intrusives is the source of the mineralizing solutions in the district. The intrusives are also believed to be associated with the central Idaho batholith.

Other intrusives include pre-mineral diabase dikes and post-mineral lamprophyre dikes, both commonly associated with large faults.

Folding of the sedimentary rocks has contributed greatly to their consolidation and metamorphism so that now we have an area within which the rocks are intimately folded into a highly contorted and complex system of anticlines and synclines, some of them with their axes overturned. In general, the axes of folds north of the Osburn fault have a northwest to



GENERALIZED VERTICAL LONGITUDINAL PROJECTION OF SILVER

northerly trend and those south of the fault predominantly strike more nearly east-west.

One of the more prominent synclines on the north side of Osburn fault is shown on the map east of Mullan. This fold may be traced northerly about nine miles to Prichard Creek, where it is offset by the Thompson Pass fault. West of this fold, to the monzonite intrusives, the rocks have been intimately folded and faulted into a complex which has not been completely deciphered. This is the mineralized area included in the Mullan-Canyon Creek-Nine Mile sections. Within this area many minor folds are superimposed on the flanks of the major folds and very steep dipping rocks are the rule. There is considerable overturning of the rocks in local folds in the area and the complexity of faulting makes correlation of folds very difficult.

South of the Osburn fault, in the Big Creek area, or so-called Silver Belt of the Coeur d'Alenes, there is a prominent anticline known as the Big Creek anticline,[5] shown approximately on the map. This is not a simple fold, by any means, for its north flank is sharply overturned and there is a complexity of related minor folds on the flanks of the larger fold. The general trend of this anticline marks the trend of the principal Silver Belt ore deposits, most of which so far have been found on the steep north flank of the anticline.

Faulting, in the more heavily mineralized parts of the district, is very complex and of great magnitude. The principal structural feature of the entire district is the great east-west Osburn fault which may be traced from Coeur d'Alene Lake on the west almost to Missoula, Montana, on the east. It is a normal fault with a southerly dip of 55 to 65 deg., and evidence seems to point to the hypothesis that the area south of the fault has been moved westerly some twelve to fifteen miles respecting the northerly side of the fault. Commonly, several hundred feed of crumpled rock, breccia, and gouge mark the wide course of this prominent feature, and it has expressed itself in the topography of the district by a series of saddles in the ridges that can be followed across the entire region.

Another large fault is the Placer Creek fault, which also traverses the southern part of the district. It may be followed a great distance both east and west of the district shown on the map. It is also a south-dipping normal fault.

Between these two major faults, in the vicinity of the Silver Belt, there are other large faults with which the mineralization of the area is more closely associated. These include the Big Creek fault, the Silver Summit fault, and the Polaris fault, all of them being south-dipping faults of considerable displacement.

Similarly, the vicinity of Kellogg contains many faults of importance with which the mineralization of the area is associated quite intimately.

On the north side of the Osburn fault, one of the older faults of the district is the Dobson Pass fault which has a northerly strike and a flat westerly dip of about 30 deg. This fault has a normal displacement. The next large fault to the west is the Carpenter Gulch fault which is a rather flat-dipping overthrust of considerable magnitude.

From Canyon Creek, easterly to the border of the map and north of the Osburn fault, there are many important fault structures, only a few of which are shown on the map. Just north of the Osburn fault there is a parallel fault system including the White Ledge and Hunter faults which, easterly from Mullan, partially define the blocks of ground containing the Hunter mine and the Lucky Friday. The "V"-shaped area included between these faults and the Monzonite is broken by a large number of rather steeply dipping faults, many of them with northwesterly strikes.

Mineralization

In 1935, Hoyt S. Gale of Los Angeles was occupied in a geologic study of the Silver Belt. At this time he observed that the purplish colors of the St. Regis formation and the gray to black colors of the Wallace formation were bleached to such an extent that the character of the original rock was largely obliterated. Shenon and McConnel in their work beginning in the fall of 1936, early recognized this bleaching process as prevalent in much of the area mapped by them.[3] The recognition of the bleaching process has added greatly to the prospective future of the district as a whole for rocks, otherwise unfavorable for ore deposits, have been conditioned by the bleaching process so that these bleached rocks can be con-

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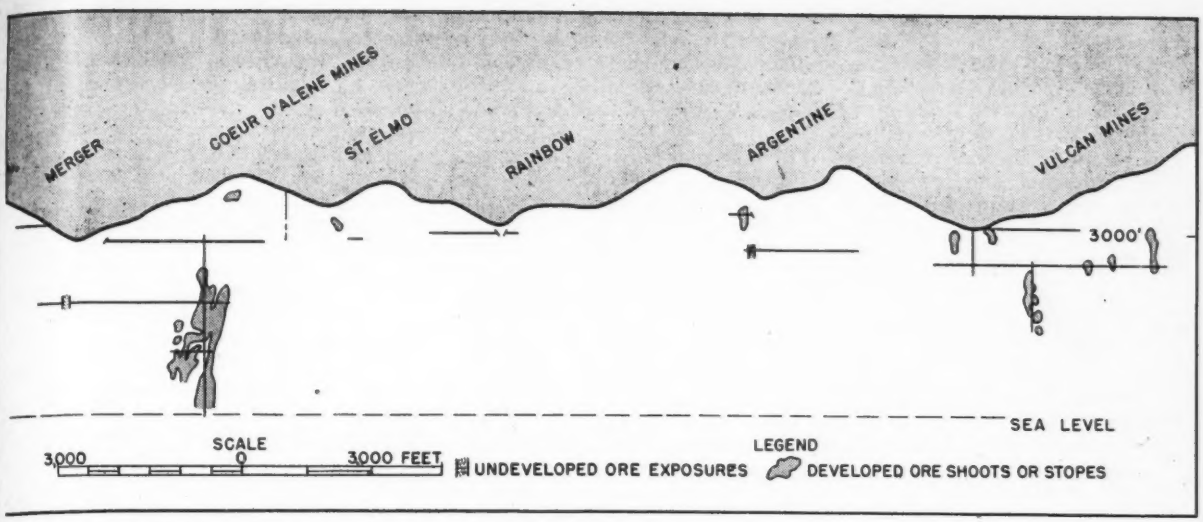

BELT OREBODIES IN THE COEUR D'ALENE MINING DISTRICT

sidered as favorable host rocks for ore deposits. The bleaching process involves the development of abundant sericite, carbonate minerals, and pyrite from the constituents present in the former unaltered sediments. These zones of bleaching are believed to occur along the zones of more intense mineralization, and the bleaching is definitely older than the stage of mineralization involving the development of the sulphides. These bleached zones, however, appear to mark the areas wherein the important ore deposits occur. In other words, bleached rocks are the most likely host rocks for ore deposits in the Coeur d'Alene district. These conclusions are borne out by the fact that most of the important ore deposits of the district have been found in zones of intense bleaching and alteration.

The bleaching process, then, is one of the earlier manifestations of the process of mineralization, subsequent to part at least of the faulting of the district, but later readjustment along the major faults, developed many sets of minor fractures along which mineralization found its way during a period of recurring structural adjustment. It is believed that the development of siderite and quartz, with some accompanying pyrite, is one of the early stages of mineralization which was followed by structural adjustment and the invasion of the sulphides. The sequence of sulphide mineralization has been pyrite and/or pyrrhotite and magnetite, sphalerite, tetrahedrite and galena, followed by later fracturing and subsequent quartz and calcite.

It is important to keep in mind that any phase of the mineralization may be lacking within a vein and that the absence of one of the stages does not indicate that somewhere within the structure the vein may not have been mineralized by the ore minerals.

In the district there are many carbonate veins which may not have been re-opened to allow the invasion of the sulphides. However, it is highly probable that portions of such apparently barren veins not yet reached by mine openings, were fractured sufficiently to allow the suphides a means of ingress.

Veins Improve at Depth

Barren veins, in unfavorable shaly rocks where fractures may be effectively sealed by impervious gouge, may give way, in greater depth, within more favorable brittle rocks, to strong well mineralized veins. We have had several examples of such conditions in the Silver Belt. The behavior of the Sunshine vein, the Coeur d'Alene Mines vein, the Polaris vein, and recently the phenomenal results in development of the Chester vein all argue that veins in unfavorable rocks may rightly be expected to improve when development enters areas with favorable wall rock.

In the Canyon Creek area, there appears to be a rather important relationship of ore deposits with particular wall rock conditions. Very productive veins in Burke quartzite in the area become weak and impoverished when development enters the slaty rocks of the underlying lower Burke and Pritchard formations.

To facilitate discussion of different types of deposits in the Coeur d'Alene district, it is necessary to divide the district into certain subdivisions. Within the divisons discussed hereafter, structural conditions are somewhat similar and the character of the mineralization does not vary greatly between mines. These divisions, except for the Murray district, are shown on the plan map.

1. The Murray Gold district is located on Pritchard Creek about twelve miles north of Wallace. It was the scene of early discoveries of placer gold which was found in the stream and bench gravels. Several lode mines were opened in the district as a result of prospecting for the source of the placer material.

In addition to the bedded veins, several shear zones show some degree of mineralization. Some of them have had a considerable production of lead and zinc, examples being the Jack Waite, Terrible Edith, and Anchor mines. At the present time some development of similar veins is being done on the Ione, Bear Top, and Orofino properties.

2. The Sunset Peak-Nine Mile Area. Production from this area is predominately zinc with lesser lead and silver. The Interstate-Callahan mine was the greatest producer in the area. Other producers include the Success and Sunset mines and several smaller producers which were revived by the demand for zinc in the recent war.

3. The Mullan - Canyon Creek

Area. The outstanding large producers of this area are the Hercules, Tiger-Poorman, Standard-Mammoth, Tamarack-Custer, Hecla, Gem, Frisco, Black Bear, Star, Morning, and Gold Hunter mines.

One of the interesting features of this section is that several of the more important orebodies, such as the Hecla, did not outcrop. The widespread distribution of overburden has made prospecting of the area very difficult and it is highly probable that as the geological knowledge of the section increases, new finds will be made. It is commonly inferred that the source of the mineralizing solutions lies in the monzonite or in bodies of similar igneous rock lying beneath the area but not exposed by erosion.

4. The Kellogg Area. This area includes the several old producers which have been consolidated into the present Bunker Hill mine, the Page mine of the Federal Mining and Smelting Co. and other smaller properties of lesser importance. The map does not do justice to the area, for in this immediate vicinity folding and faulting prevails on a grand scale. The Bunker Hill orebodies are closely related to the Cate and Dull faults, and they consist of fissure fillings, such as the "Sierra Nevada, Stewart, Caledonia, Jersey, 'N', Francis, Barr, Mac, and Emery veins," and mineralized breccia zones on the footwall and hanging wall of the Cate faults. Orebodies of this type include the Hatton, Roberts, Fan, Stanley, Pate, Towers, Flint and Landers, the latter three being components of the great March shoot.[9]

Page Mine Finds More Ore

At least two veins have been developed in the Page mine, the Tony vein thus far having been found to be the more productive. Recent development eastward along the vein in the deeper workings has opened additional ore of great importance and has added to the property's future. Exploration easterly has a good chance of extending the strike length of the orebody.

An interesting consideration, pointed out previously, is that many geologists believe that the Kellogg area and the Pine Creek area just south of the latter, have been offset westerly on the south side of the Osburn fault, a distance of 12 to 15 miles. Some possible matching of similar folds on each side of the fault has been attempted, but the evidence is not conclusive enough to be accepted without careful study and attempts at more detailed correlation.

The Kellogg area includes the largest lead-zinc mine in the Coeur d'Alene district, and its production reaches back over a period of more than fifty-five years. Published ore reserve figures of this great Bunker Hill mine indicate a reserve good for ten years of production and continual development maintains these reserves.

5. The Pine Creek Area. In the Pine Creek area are the Sidney, Little Pittsburgh, Douglas, Constitution, and Highland Surprise mines. In general, the mineralization of the Pine Creek area exhibits higher temperature characteristics than the mines in the other areas of the camp.

The recently developed extension of the old ore shoots in the Sidney mine is one of the outstanding developments in the Pine Creek area. Here, an easterly drift beyond known ore shoots exposed a better ore shoot of larger size than that mined previously. This new shoot has been variously estimated as containing up to twelve years production, for a 250-ton mill, of proven ore of a grade above 20% in combined lead and zinc. This discovery has added considerable attractiveness to prospecting in the Pine Creek area.

6. The Silver Belt area is the newest productive addition to the Coeur d'Alene district, although some of the oldest locations in the district were made on what is now the Polaris property. The producers in this area are primarily important for their silver production; however, a newly discovered orebody on the Chester vein has yielded a remarkable lead production. This area lies south of the Osburn fault and north of the Big Creek fault in the section between Big Creek and Wallace. Thus far, the productive veins are for the most part located on the overturned north flank of the Big Creek anticline. The veins consist of siderite and quartz with variable amount of pyrite, tetrahedrite, and galena, with occasional showings of arsenopyrite, sphalerite, specularite, and chalcopyrite. Many of the veins appear on the surface and in upper workings as barren siderite-quartz veins, while others have shown a small production in the upper workings.

It remained for the Sunshine mine to demonstrate the importance of the Silver Belt veins, when, by persistent deeper development they exposed the remarkably productive Sunshine orebody. Although discontinuous and meagerly productive shoots were found near the surface in the old Yankee Boy stopes, and rather important shoots from the 110 level up to the 500 level, the important and rich shoots were not reached until the 1500 level was developed. From this level downward to and below the 2700 level, the main Sunshine ore shoot contained remarkably rich silver ore. Later development disclosed the presence of "B" and "D" veins, which added considerably to the production record and aided in paying dividends of almost $26,000,000 over a period of about 17 years. Production still comes from these Sunshine veins.

Chester Vein Is Developed

Persistent development on the part of the Polaris Mining Co., through the 2700-level workings of the Sunshine mine, in the attempt to explore the deep extensions of the Polaris and Chester veins, resulted in the discovery of a bonanza orebody in 1943. This vein on the upper levels of the Polaris mine and in the Chester tunnels was explored in unfavorable Wallace shales. On this new deeper level, the vein is in bleached St. Regis quartzite under conditions more favorable for the deposition of ore. Parts of this new orebody have been found to be very rich in lead as well as remarkably rich in silver. Production was pointed at the lead-rich sections because of the demand for this metal during the war. In two years, this orebody was developed through a vertical range of more than 1,400 ft., the lowest level developed thus far being the Sunshine 3700. Through a cooperative arrangement, due to property complications, and because of the proximity of the Sunshine workings, the Sunshine Mining Co. does the mining in the area and the output is split between the Sunshine and Silver Syndicate companies in one area, the Sunshine and Polaris in another area, and between the Silver Dollar, Sunshine and Polaris companies in another area. A remarkable thing about this new orebody is that it does not outcrop and that it was discovered almost 4,000 ft. below the surface.

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On its westerly extension the Chester vein makes a junction with a prominent structure known as the Silver Summit fault. It strikes north 70 deg. to 80 deg. west and dips southerly 55 deg. to 75 deg. In the vicinity of the Sunshine mine this structure has been named the Silver Syndicate fault, or vein, because of its relationship to the Silver Syndicate property. From a point where the Chester vein makes a curved junction with this fault on its footwall side, the profitable ore continues westerly along the fault on several levels. The ore along the Chester vein, plus the ore along the Silver Syndicate fault, makes a continuous orebody approximately 1,000 ft. in length on the 3100 level. An additional westerly development of this vein on the 3100 level for a distance of about 700 ft. exposes another ore shoot shorter in length but similar in character to the main shoot.

Silver Syndicate Fault

About one-half mile westerly from the work above described and directly north of the Jewell shaft of the Sunshine mine, diamond drilling followed by crosscutting opened another shoot of fine lead-silver ore which has not yet been thoroughly developed. Its character is similar to that of the usual ore on the Chester vein, but the shoot occurs on the Silver Summit or Silver Syndicate fault, and as stated in Sunshine's 1946 annual report, it is 169 ft. in length and averages 4.2 ft. wide carrying 47 oz. of silver and 22% lead. Westerly work on this structure certainly has a good chance of developing other shoots of similar ore.

The section of the Silver Syndicate vein, remaining undeveloped between the easterly and westerly work and more than 2,000 ft. in length, is quite likely to contain a good ore shoot because of the indications found within the same general area on the Silver Syndicate or Little Sunshine tunnel level. To enlarge on this probability, it might be well to point out that on the Chester vein at the surface, a small shoot of ore was mined and shipped during the very early history of the camp. On the Chester tunnel level a few minor showings of sulphides were also found in drifting. The Polaris company on the 1000 level found short sections of the vein which contained a complex of sphalerite, galena and pyrite, but widths were narrow and the sulphides had a lensy occurrence. On the Polaris 2300 level similar results were indicated by development, yet very deep development beneath one of these upper sulphide exposures opened the extremely rich Rambo-Omega-Rotbart shoot in the well-bleached and more quartzitic St. Regis formation.

Like these shallow exposures in the Chester vein, the Silver Syndicate or Little Sunshine tunnel opened similar showings of sulphide mineralization on the tunnel level just below the footwall of the Silver Syndicate or Silver Summit fault, and shallow shaft development indicated some slightly deeper expression of the mineralization. This upper expression of rather weak mineralization in unbleached argillite of the Wallace formation, like the Chester vein experience, may be expected to develop a profitable ore shoot in the bleached St. Regis formation on the lower levels in the section of the vein remaining undeveloped between the eastern and western areas.

Yankee Girl Vein Explored

Another very interesting piece of development in the Sunshine mine is taking place a little more than 1,000 ft. south of the Sunshine vein on the 3100 level, or approximately 2,100 ft. south of the Jewell shaft. A southerly crosscut on the 3100 level found the Yankee Girl vein and the structure has been followed by drifting for a length of approximately 2,600 ft. Many interesting shoots of good ore have been opened by this drift and some stoping has been started. The drift is advancing westerly in property owned by the Sunshine Consolidated Mining Co. Metropolitan Mining Co. has an interest in some of the ore opened in part of this 3100-level drift and Sunshine and Sunshine Consolidated own a larger share. Being opened rather completely on this deep horizon only, the possibilities of this structure have not been determined. The Yankee Girl vein was opened by a shallow tunnel on Big creek, but no ore of importance was found. This vein strikes about east-west and dips southerly at approximately 70 deg.

Through a cooperative agreement between the Sunshine Mining Co. and the Metropolitan Mining Co., a long southerly crosscut is being driven on the Sunshine 3100 level to explore the deep extensions of the Metropolitan veins. Metropolitan explored its vein system from its tunnel level and from shallow shaft levels and, in the course of this development, interesting showings of silver-bearing tetrahedrite were found. The deep work is being done in the expectation that these meager near-surface expressions of the sulphide mineralization wil have a history like that of the Sunshine, Polaris, Chester and others when a deeper horizon in more favorable rocks is reached.

The Crescent mine, owned by the Bunker Hill and Sullivan Mining and Concentrating Co. is shown on the longitudinal projection. The Crescent ore shoots occur along the sheared hanging-wall of the south-dipping Alhambra fault in strongly bleached St. Regis and Revett quartzite. The stopes are located approximately one mile westerly from the Sunshine shaft and, as shown on the longitudinal projection, the vertical range of the stopes is about 2,500 ft. The results of development on the 1200 level were quite disappointing, but later development in the Silver Belt at much depth has been so encouraging that deeper exploration of the Crescent vein certainly appears amply justified.

The Big Creek Apex Company's property is situated immediately west of the Sunshine mine and east of the Crescent mine. Through a working agreement between the Sunshine and Big Creek Apex companies, this property will be developed from a deep Sunshine level. It contains vein structures which may be expected to be productive in greater depth.

The Polaris Mining Co., controlled by Hecla Mining Co., revived development as a result of the encouraging results in the Sunshine mine. As shown on the longitudinal projection, ore shoots of very limited size were mined by the early operators above the level of the Polaris tunnel. These shoots occur on a strong but narrow siderite vein striking approximately east and west and dipping southerly 60 deg. to 75 deg. The vein occurs in the block of ground bounded by the Silver Summit fault on the north and the Big Creek fault on the south, and it is located on the partially overturned north limb of the Big Creek anticline. In the upper levels of the mine, thin-bedded bleached Wal-

lace argillite is the wall rock, while on deeper levels, beginning approximately at the top of the main orebody, bleached St. Regis and argillaceous quartzites are the general rule. In the Polaris mine the zone of strongly-bleached rock is approximately 1,000 ft. in width.

With the very small exposure of borderline commercial ore on the tunnel level coupled with the successful developments in the Sunshine mine to encourage the Polaris company, a vertical shaft was sunk to explore the vein at deeper locations. The 200 level, 600 level and 900 level crosscuts were driven southerly through the vein system without disclosing an orebody, but by persistent drifting on several of the veins on the 900 level, commercial ore was found after the expenditure of about one million dollars. This shoot proved to be about 400 ft. in length and it was mined to the 2300 level as shown on the section. The cost of development of the orebody and several dividends resulted from the mining of this orebody.

Deep Exploration Profitable

The Polaris veins were partially explored again on Sunshine's 1900 level, but no commercial ore was found. The deeper development on the Sunshine 2700 level, driven for the account of the Polaris Mining Co., did find commercial ore shoots on the Polaris vein system and deeper development of these shoots may be expected to yield good results. On this same level, after the Polaris veins were prospected, the northerly crosscut was driven to explore the Chester vein. This is the point of discovery of the very rich orebody which is giving much of the added impetus to present deep development in the district. Where first cut, 16 in. of clean galena ore assayed 70.1% lead and 144.5 oz. silver. Twenty-five feet east of the crosscut the vein widened to five feet assaying 70% lead and 148 oz. of silver. Needless to say, there was much joy in the Polaris ranks. Because of property complications resulting from development of this structure dipping southerly outside the side lines of Polaris claims, Sunshine, Polaris, Silver Syndicate, and Silver Dollar made a division of the ore which might be expected with further development. During the course of the next two years after discovery, this vein was developed through a vertical range of more than 1,400 ft. from the Sunshine 3700 level to the Sunshine 2300 level. The top of the orebody probably has been reached but it continues below the 3700 level an unknown distance.

The next deep shaft development toward the east is being done by the **Silver Dollar Mining Co.** in property which they have under long-time lease from the Lincoln Mining Co. The Silver Dollar receives profits from ore mined in the Rotbart area, a part of the new orebody on the Chester vein, and this income is providing the funds for deep development of the Chester vein in their leased property. The main shaft from the Lincoln tunnel reaches to the 1800 elevation about 900 ft. above sea level, and an offset winze from this level has been sunk to the 2400. This shaft is to be deepened to the 2700 which will be approximately sea level elevation.

In the Silver Dollar, or Lincoln mine, short shoots of commercial ore have been stoped in the section of the mine reaching from the 1000 level to the 600, and a few small patches of interesting silver mineralization were found in the shallow Knickerbocker tunnel and the Silver Dollar tunnel. Down to a point a short distance above the 700 level, the wall rock on both the hanging wall and footwall of the vein is dark unbleached Wallace argillite, but from the 700 level to the present bottom of the mine the hanging wall is well-bleached, although the footwall, even on the lowermost level, is dark, unbleached Wallace argillite.

It is anticipated that slightly more depth will reach a point where both walls of the vein will be well-bleached. This should have a beneficial effect if the experience of other developments can be used as a guide.

The Silver Summit Mining Co. recently completed its shaft to a point 339 ft. below sea level. Some publicity was given to this shaft-sinking job because of the speed records made by the use of the Riddell clamshell shaft mucker. The lowest level from this shaft is known as the 3000 and it is only slightly higher than the Sunshine 3100 level. From this new level the Silver Summit Co., backed by Polaris Mining Co., is driving both north and south crosscuts to explore veins in its property and in several adjoining properties with which it has operating agreements. This development project eventually may explore the Silver Summit vein in Silver Summit and Merger properties, the Chester vein in Chester, Silver Summit, and Yakima Shoshone properties, and other known veins in all of the properties above referred to.

The longitudinal projection shows some of the shallow exposures of lead, silver or zinc mineralization which have been found in less favorable unbleached rocks. It is expected that the veins to be developed from the 3000 level will be found in more favorable bleached St. Regis quartzite. Exploration in these bleached rocks beneath the small mineralized sections exposed in shallow workings is expected to find commercial ore. Although the eventual total expenditure will be very large, it is not being applied toward the development of only one possibility; on the contrary, many "good bets" will be explored, and any one of them may reveal orebodies similar to the deep orebody found in the Chester vein farther west.

Silver Summit Finds Ore

Recently, the southerly crosscut opened a six-foot vein containing two feet of siderite, tetrahedrite, and chalcopyrite which assayed 33.8 oz. silver and 5% copper. Drifting on this structure will have to await crosscutting to the main vein which lies more than 1,000 ft. southerly. In the levels above, this new vein was exposed, but it was thought to be unimportant; hence we may expect the much stronger veins on the upper levels to be of great interest when they are reached on the 3,000 level. This new commercial-grade exposure gives confidence to the operators of the other deep development programs, and opens many other geological possibilities in the district.

The Coeur d'Alene Mines Corporation has the next deep shaft easterly from the Silver Summit. The early history of Coeur d'Alene Mines is not unlike that of several other properties, early-day development having disclosed meager near-surface shoots of ore which were sporadically worked, but deeper tunnel development gave little encouragement. Development of the Sunshine orebody and others gave the development of this property added impetus.

On the tunnel level, the Coeur d'Alene Mines vein is a strong quartz and siderite vein almost entirely devoid of interesting sulphide mineralization. The vein is

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located in the block of ground bounded on the south by the Polaris fault and on the north by the St. Elmo fault. Where cut by the first shaft level, that is, the 1000 level, a strong siderite vein contained excellent ore. The orebody was developed along this level for more than 400 ft. and it later proved to extend upward approximately 600 ft. higher, but never reached the tunnel level. The orebody has been mined through a vertical range of approximately 2,000 ft. The new deep level in the mine, known as the 2800, is located approximately at sea level. The main vein has been cut on this level and drifting toward the ore shoot has begun. The results of development on this new, deep level should prove interesting.

In addition to drifting on their own vein, a long, southerly crosscut is being driven to explore the American Silver, Silver Standard, Freeman-Sites, Michaels and Fahle, and Sterling Silver properties. Like cooperative programs in the Sunshine and Silver Summit areas, the Coeur d'Alene Mines Corporation and the Coeur d'Alene Consolidated Silver-Lead Mines, Inc., have arranged to explore veins of properties southerly from the Coeur d'Alene Mines shaft. Known veins at high elevations are to be explored at this sea level horizon under conditions which are expected to be favorable for the location of commercial ore shoots. Division of ore which may be found is covered by agreements among the several companies involved.

Coeur d'Alene Mines Corporation also controls the property of the Rainbow Mining Co. located easterly from the shaft. Plans for the development of this group have not been announced.

The St. Elmo property is not being developed by any of the current operating companies, but shallow work in the mine revealed a very interesting small shoot of silver-bearing ore containing considerable zinc. The vein occurs in the same fault block which contains the Coeur d'Alene Mines vein. As far as it has been developed in the shallow workings, the vein dips at a low angle toward the south.

The Argentine claim, easterly from the Rainbow property, received considerable attention during the early days of the camp. The vein was explored by shallow tunnels and a short shaft and stoping of the vein was continuous through a vertical range of almost 400 ft. The silver ore produced from this small stope is reported to have been of good grade. This vein lies between the Polaris and Argentine faults. It dips southerly 50 deg.

The Vulcan Silver-Lead Co. owns the Galena mine on Lake Gulch just west of Wallace. This is a new company, organized to develop a large number of claims which include the old Galena mine. This property was actively operated by the Callahan Zinc-Lead Co. during the period 1922 to 1938 and the mine produced about 136,000 tons of lead-silver ore from the 1600 level to the surface, largely during the years 1926 to 1930. Adverse conditions caused the suspension of operations during the depression and the mine was allowed to fill with water. Ore was found in steep-dipping veins located a short distance south of, and in, the hanging wall of the Galena fault which may prove to be the easterly extension of the Polaris fault. Production came from several veins located in highly bleached argillaceous rocks of the Wallace formation.

Vulcan Co. Explores at Depth

Through an agreement between the Vulcan company and American Smelting and Refining Co., the latter is providing the funds and directing the work at the mine. Plans now being carried out include deepening the present shaft to a point approximately 3,000 ft. below the surface or near sea-level. Work on this new level will be directed to development of the Galena vein system approximately 1,500 ft. below the former lowest level in the mine. It is expected that the smaller orebodies in the bleached Wallace formation on the upper levels will give way to much larger and higher grade orebodies on the new deep level. This development program is another costly development venture, but the recent exposures in the Silver Belt amply justify the expectation of success. Recently it has been announced that the Day companies, owners of the Fern group, south of the Vulcan group, are to provide 25% of the cost of the shaft work. Final plans have not been released.

7. The East Silver Belt might be the proper designation of the section between Placer Creek on the west and the Atlas mine on the east, bounded on the north by the Osburn fault and extending southerly an indefinite distance. This area contains outcrops of broad continuous bleached zones similar to those in the Silver Belt, but no recent geological mapping of the area has been done by government agencies, although shortly the U.S. Geological Survey expects to completely map the section. During the past year, Hecla Mining Co. has become interested in the vicinity of Rock Creek where it has acquired the Gem State group, the Nelson-Hansen group, and a large number of claims located on its own behalf. The property covers a section more than two miles in length east and west and almost that distance south of the South Fork of the Coeur d'Alene River.

Since the company became interested in the area, its geologists have mapped some of the main features and the results indicate the presence of very wide and continuous zones of intense bleaching in favorable St. Regis rocks reaching from this group easterly to the Atlas mine and beyond. Large folds similar to the Big Creek anticline follow the same general trend as the bleaching, and strong faults have been noted. Many siderite veins containing small amounts of lead, zinc and silver have been discovered on the surface, and the veins, like those in the Silver Belt, appear to follow small tension fractures developed as a result of differential movement along the larger faults. Erosion has removed more unfavorable Wallace formation from much of the area and it has exposed bleached St. Regis quartzite rather deep beneath the Wallace-St. Regis contact.

The program of development of the area acquired by Hecla has not been completed, but surface prospecting by bulldozer work, some shallow tunnel work, and geological mapping are planned for this season. A shaft is being sunk near the north side of the property in part of the Gem State group to explore veins outcropping near the South Fork.

The Moe property, east of the Rock Creek Group, contains similar veins in bleached rock in close association with strong faulting.

The Atlas mine south of Mullan also occurs in the same belt of rocks, and several interesting lead-zinc showings have been found in shallow workings. In the Atlas area a prominent and very continuous zone of chloritized St. Regis quartzite traverses the prop-

erty and bleaching, as a slightly later manifestation, affects the chloritized quartzite as well as the original purplish St. Regis.

8. The Lucky Friday area should properly be referred to in this presentation because it is one of the most encouraging deep developments now in progress in the Coeur d'Alene district. It is separated from the East Silver Belt by the Osburn fault and it might more properly be considered in connection with the Mullan area. However, this property is located in a block of ground between the White Ledge fault on the north and the Osburn fault on the south where little deep development has been attempted in the past. The work at the Lucky Friday has started much other development in the eastern extension of the same block of ground and currently Hunter Creek, Vindicator and Idaho Silver are doing development work easterly from the Lucky Friday.

The Lucky Friday company started a shaft about seven years ago from its tunnel level. This shaft opened several levels, and small shoots of ore on these levels provided most of the money necessary to develop the mine to the present bottom level which is the 1400. In the mine the St. Regis quartzite is as intensely bleached as any of the rock in the Silver Belt and many small faults and strong zones of shearing indicate that it is an area of great structural disturbance. However, the vein has persisted and increased in metal content to the present bottom level where the length of actual commercial ore has become of very great interest. The ore differs somewhat from that in the Silver Belt because along with a high silver content the vein carries abundant galena and considerable spalerite. At the present time the ore shoot is being prepared for stoping on the 1400 and 1000 level and an interesting production record will result. Deeper development is indicated for the future.

Hunter Creek and Lucky Friday Extension mining companies are using the Lucky Friday shaft in development of their properties also.

Operating mines in other parts of the Coeur d'Alene district are deepening their shafts in exploration of known ore shoots and the deeper development of most of the operating mines results in extension of the shoots to increasingly deeper horizons.

It is proper that at this point we should consider the probability that most of the orebodies found in the Coeur d'Alene district in the future will have very meager surface expressions, or none at all, and that orebodies will be found mainly by persistent and extremely expensive exploration at depths which have made many people shudder when considering the costs involved.

Acknowledgments

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Simple Chemical Tests To Aid Prospectors

PAUL LEACH
Washington Office
McGraw-Hill Co.

ONE OF THE NEW scientific tools that gives promise of aiding in the increasingly difficult search for ore deposits is geochemical prospecting. This, in brief, is searching for ore or conditions associated with ore by chemical analysis, including spectroscopy.

A research crew, consisting of H. E. Hawkes, acting chief of the Geological Survey's geochemical prospecting unit, L. C. Huff, hydrologist, Helen Cannon, geobotanist, V. P. Sokoloff, soil scientist, and H. W. Lakin, chemist, has been working quietly for a year to prove the theory that quantitative analysis of water, plants, residual and alluvial soil and glacial till can give definite leads to some hidden lodes of important metals.

The work in the past year has fairly definitely proven that geochemical prospecting can be carried on in the field without the necessity of a large laboratory or expensive and bulky equipment. It appears that one man with a few bottles of chemical reagents, a test tube, and a graduate will be able to determine metal content in extensive areas in a matter of days, either by testing the water, the ground, or the plant life.

One of the best geochemical prospecting methods, particularly for zinc, is to check ground water and wells in an area for metallic content. By taking samples of water from a river or creek and its tributaries, the new-style prospector may follow his "color" upstream and discover an orebody much as the gold panner does with color in the pan.

The procedure is simple. The prospector dips a sample of water and pours it into a test tube containing a solution of dithizone (one-thousandth of one percent in carbon tetrachloride), and shakes the tube. If metal is present, the greenish color of the reagent changes to a pink hue, the depth of the color indicating the amount of metal in solution.

Working on the assumption that copper and zinc predominate over the other heavy metals, the prospector then adds a drop of weak

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GEOCHEMICAL TESTS AT BUTTE, MONTANA

Sample No.—Location	Copper (ppm.)	Zinc (ppm.)	Iron (ppm.)
1 Silverbow Creek, just below mines	60 to 80	400	80
2 Same, downstream	20	150	30
3 Same, still farther downstream...	15	100	11
4 Same, still farther downstream...	10	80	2.5
5 Same, now Deer Lodge River.....	0.5	25	0.8
6 Same, now Deer Lodge River.....	.08	10	0.4
7 Same, 32 miles below Butte.....	.05	3	0.8

NOTES OF OBSERVER: The zinc is higher than copper in No. 1 (though not in the mine water) because approximately 90% of the copper is removed in the precipitation plants and is replaced by iron. Apparently most of the iron is precipitated almost immediately, above pt. 1, as the hydroxide. Zinc is about the same in No. 1 as in the mine water. Downstream the zinc concentration appears to decrease chiefly by dilution; the copper and iron decrease less regularly and may be precipitated in part as hydroxides as the alkalinity increases. At any rate the series shows that the heavy metal content can be traced for many miles below the source.

H. E. HAWKES, acting chief of the U.S.G.S. Geochemical Prospecting Unit, takes a sample of stream water for quantitative analysis. All the equipment needed for the job is shown on the rock.

hydrochloric acid to the tube. Here a second reaction takes place, producing a color change when the acid changes the equilibrium of the solution. This makes the zinc-dithizone (pink) compound dissolve in the water, leaving the carbon tetrachloride and any copper present showing another recognizable color, which can be checked by comparison with a table to show amount present. By subtracting the amount of copper present from the first reading which indicates total metal content, the zinc reading is obtained.

Thus, using 50 cc. of water, with a reading of five micrograms of zinc and two of copper, by simple mathematics the prospector knows that at the point of sampling the stream contains 1/10th of a part of zinc per million and 1/25th of a part of copper per million. The whole test takes about five minutes to complete.

Preliminary tests by Mr. Huff have shown that zinc is carried farther in stream water than is copper, which, in turn, travels farther from its source than iron. Additional tests will be made to extend these studies to other metals.

Tracing the metal content downstream from Butte, Mr. Huff worked out the data shown in the accompanying table.

It has also been found that lead is most easily checked in residual soils and zinc again is easily and readily traced in plants and leaves. Copper can be found, though less readily, by both methods.

Although concentration of copper, lead, and zinc in soils is apparently related to the alkalinity, presence of organic matter, other soluble salts present, and parent rock, the normal copper and lead content in soils ranges from about 10 to 50 parts per million. Zinc, more readily transported and picked up, ranges from 20 to 150 parts per million.

In the checking of vegetation the group has found that certain common plants and trees will take up large quantities of some metals and concentrate them in their leaves. A study was made by W. O. Robinson, Bureau of Plant Industry of the Department of Agriculture, of the rare earth content of the leaves of hickory trees growing on a wide variety of soils. Results of this study show a very wide range of rare earth content, from 2 ppm. to a maximum of over 8,500 ppm., indicating that trees reflect presence of metals in relation to concentration in the ground.

Ragweed Indicates Zinc

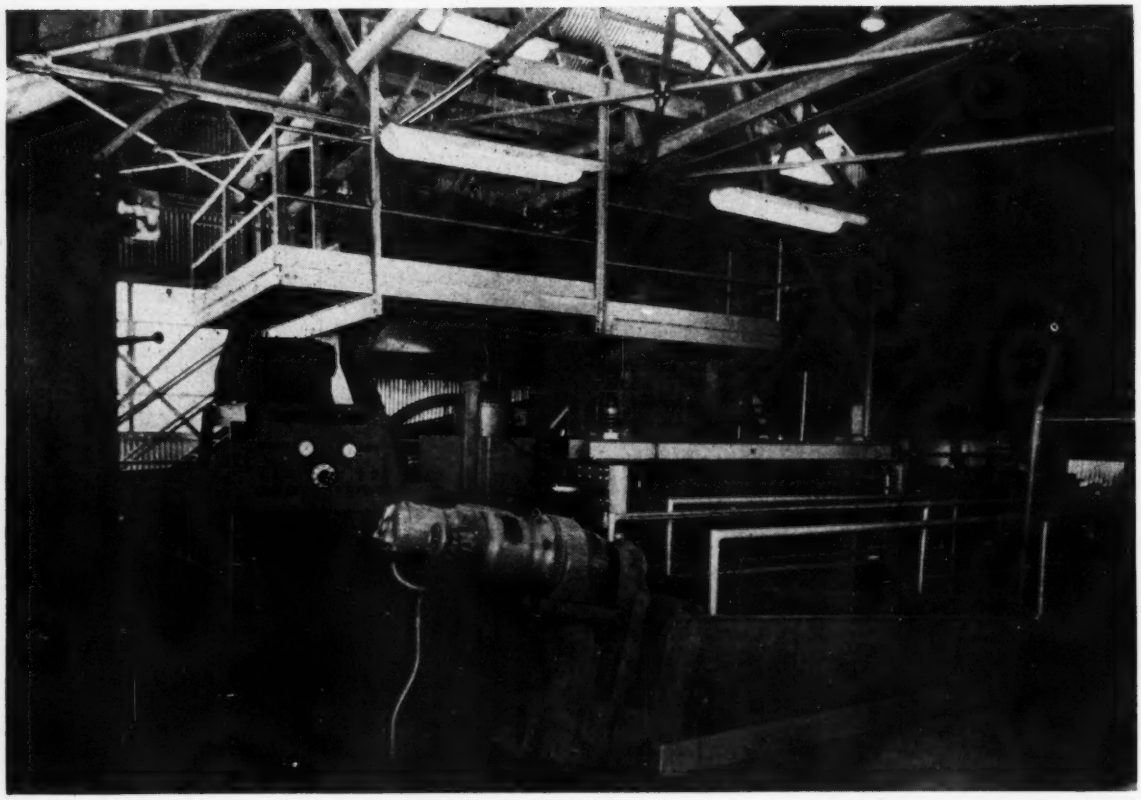
In studies of zinc-bearing plants, a specimen of ragweed collected from a zinc outcrop was found to have 3,800 ppm. of the metal in its green parts. Ragweed growing on normal soils contains only a very small fraction, from 10 to 50 ppm. of zinc. Copper has been reported in plant matter in concentrations as high as 560 ppm. as compared with an average content of 5 to 20 ppm.

For some time it has been known that the peat bogs between Rochester and Niagara Falls, N. Y., contain an unusual concentration of zinc, but the muck is so thick that it is almost impossible to get down beneath it to check the bed rock or find the source of the metal without actually drilling a test hole. The researchers have found that the zinc in the peat is derived by leaching of underlying dolomite. They have also obtained enough evidence to locate at least one fault running north-south through the bog.

From initial prospecting last summer in the area, the USGS crew developed a "hunch" that there is a significant deposit in the area. Although there are no outcrops to bear this out, traces of sphalerite were found by the party in the vicinity of the bog. After another summer of geobotanical and geochemical work on the bog, including plant checks and analysis of the ground water in the area close by, the party may discover enough positive information to warrant test drilling. The presence of unusual zinc, plus the discovery of sphalerite, plus the delineation of a fault, is reason for suspicion.

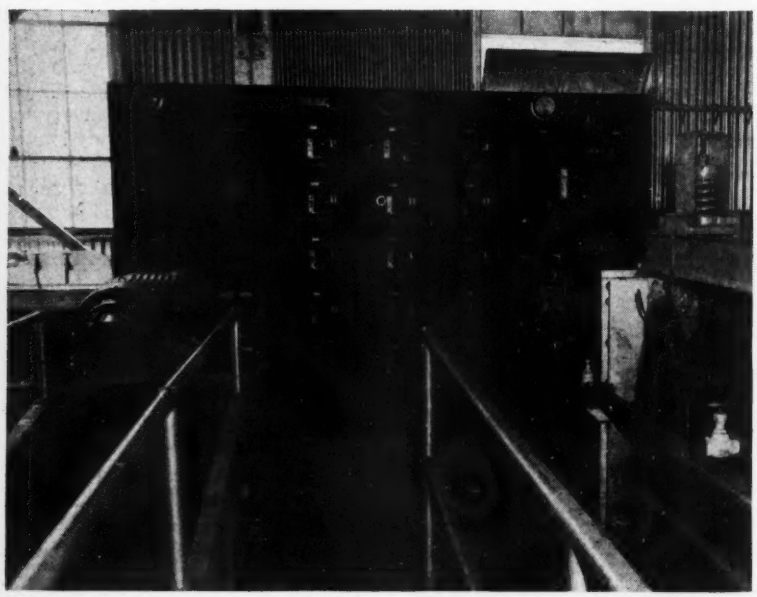
Several undeveloped sections of the West and Midwest will be prospected by members of the crew this year to provide a final check on the process in virgin territory. Eastern Tennessee zinc areas may also be checked.

Although the members of the crew are now certain that the new prospecting method will work, the evidence which will have accumulated at the end of another field season should be overwhelmingly conclusive in favor of continuing the study of this device for saving time, money and labor if necessary. Ultimate aim of the USGS is to perfect a prospecting method which it can turn over to the mining industry.



ONE-MAN OPERATION is permitted by compact arrangement. Separatory cone, 10 ft. in diameter, is seen on far side at left with air-control panel in front. In foreground are the densifier and its drive, and beyond it the feed elevator and primary washing screen.

Sink-and-Float Separation



SWITCH CONTROL PANEL, end of which is seen at left of accompanying interior view. Each switch is lettered to indicate the motor it controls.

WILLARD C. LAY
Mill Superintendent
Fluorspar Division
Aluminum Ore Co., Rosiclare, Ill.

HIGH PURITY IS ESSENTIAL in the fluospar used by the Aluminum Ore Co. in making hydrofluoric acid, cryolite and various other fluorine products. At Rosiclare, Ill., where it mines and concentrates this raw material, all plant work is directed to making a concentrate that analyzes 98% CaF_2, less than 1% SiO_2 and under 0.2% in combined sulphides. To remove the small amount of zinc and lead sulphides present in the crude ore before concentrating the fluorspar, a preliminary bulk float had been employed, the concentrate being sold to a neighboring plant which separated the lead and zinc. The fluorspar concentrates subsequently produced were dried, reground to minus 400 mesh, and shipped to the acid plant

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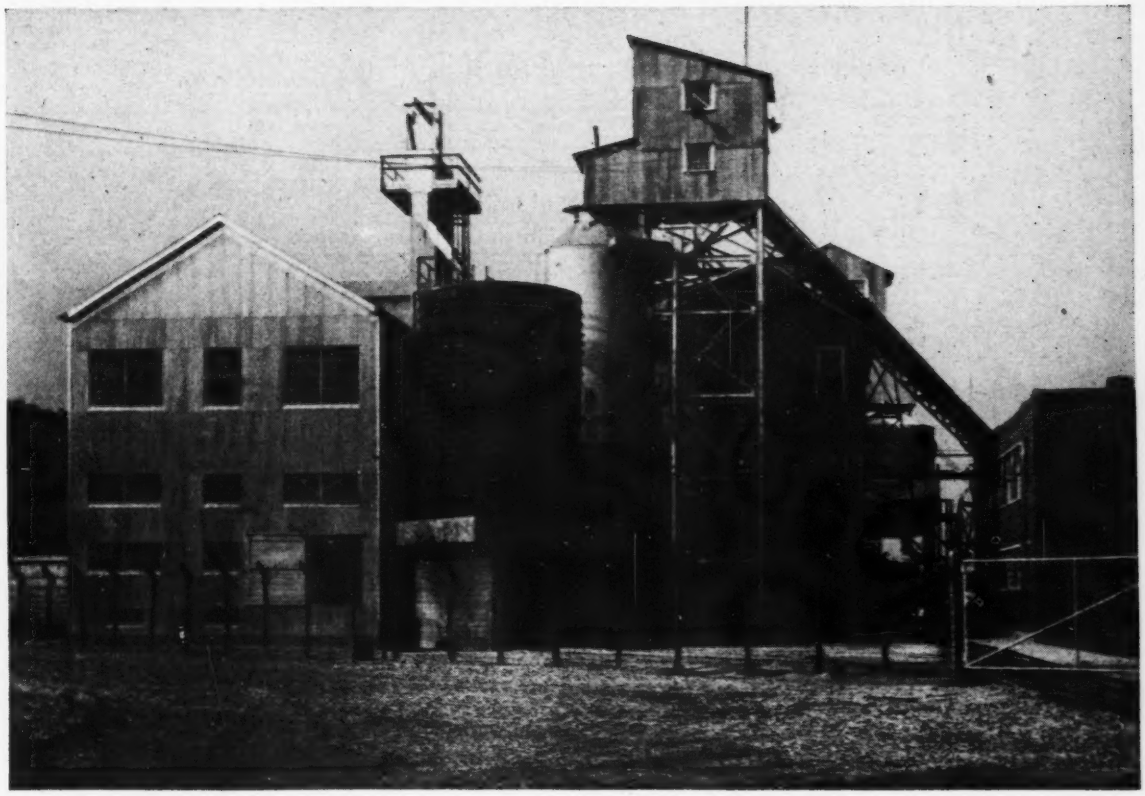

CONCENTRATOR of Fluorspar Division of Aluminum Ore Co., at Rosiclare, Ill. On the left is the sink-and-float section. The flotation section is in the center. Brick building at right contains the locker room. The north end of the mill is shown.

Improves Fluorspar Recovery

in hopper cars to protect them.

In the past, the fluorspar concentrates made came from treating high-grade ores by flotation only. The need of mining ore of lower grade, however, and of getting better metallurgical results, coupled with rising costs, made it apparent that operating methods would have to be restudied.

We wished to mine the narrow portions of the veins and at the same time avoid the mill losses which would occur when low-grade ore is used for flotation feed. The ore itself is a mixture of calcite, fluorspar and a few tenths of a percent each of lead and zinc sulphides. In mining, however, it is diluted by varying amounts of limestone or sandstone which form the vein walls. It is free milling to such a degree that most of the mineral is liberated by crushing to minus half-inch. Fluorspar has a specific gravity of 3.01 to 3.25, whereas that of the gangue minerals runs 2.65 to

THE 30-IN. DENSIFIER in foreground. This machine is the one shown in photograph on opposite page. Beyond it is a Crockett wet-belt magnetic separator.

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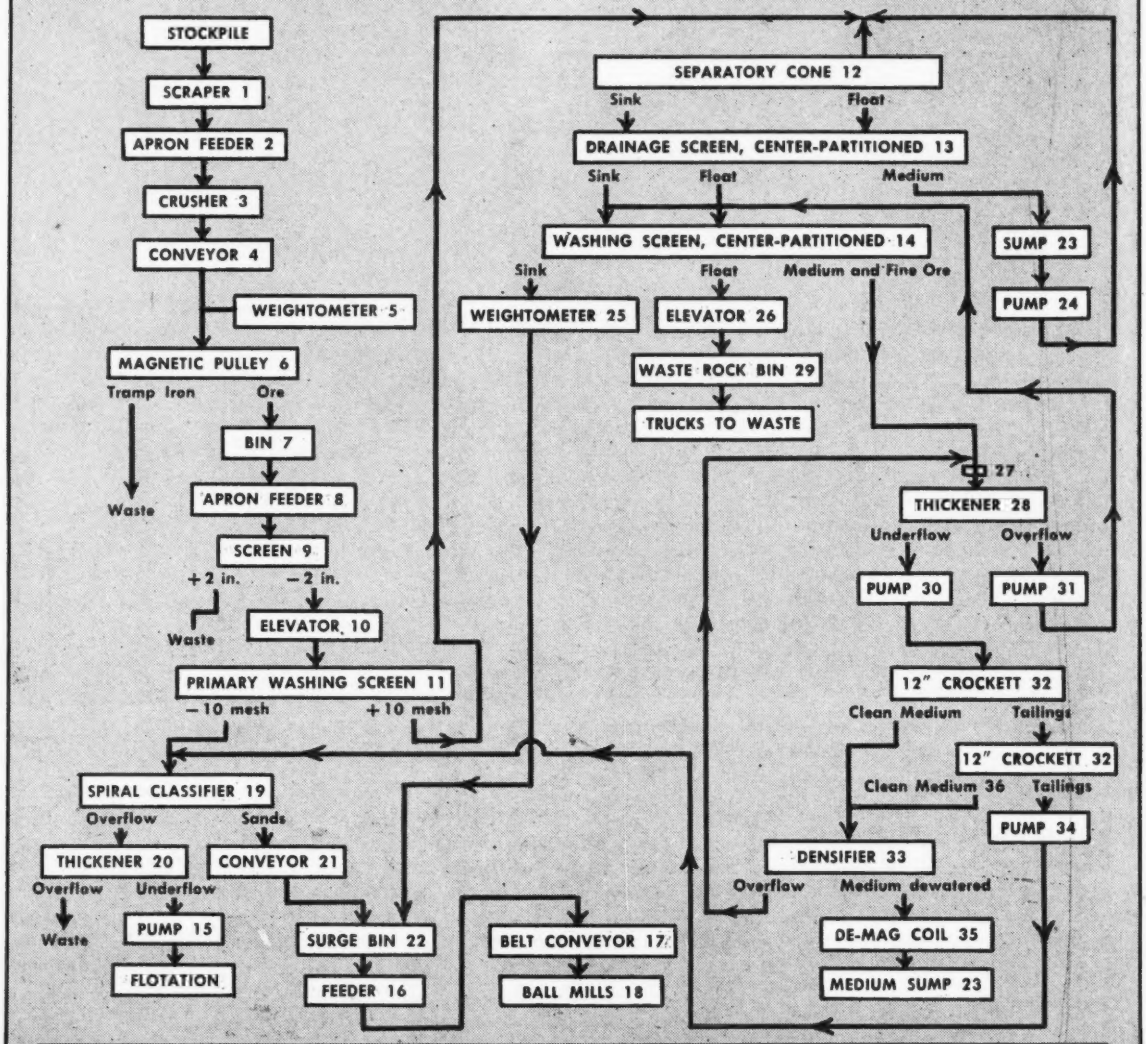
ALUMINUM ORE CO. — FLUORSPAR FLOWSHEET



LEGEND

1. 1-cu. yd. Westeco drag scraper, powered by 3-drum, 50-hp., Ingersoll-Rand hoist
2. 36"x60' Link-Belt pan conveyor
3. No. 3620 Dixie hammer mill
4. 18"x279' Barber-Greene belt conveyor
5. Merrick Weightometer, Type E, ¾ hp.
6. Dings magnetic pulley, 18"x4'
7. 15'x24' cylindrical storage bin, 250 tons capacity
8. 30" Link-Belt apron feeder, 5 hp.
9. 3'x6' Robins Gyrex single-deck screen, 3 hp.
10. 12"x7" Link-Belt feed elevator, concrete case, 7½ hp.
11. 3'x10' Allis-Chalmers primary washing screen, 7½ hp.
12. 10' Wemco sink-float cone, outside air lift
13. 4'x10' Allis-Chalmers medium-drainage screen, 7½ hp.
14. 4'x10' Allis-Chalmers medium-washing screen, 7½ hp.
15. 2" duplex Dorr diaphragm pump, 2 hp.
16. Size D Hardinge Constant Weight feeder, ½ hp.
17. 18"x50' Stephens-Adamson belt conveyor
18. Marcy No. 54 ball mill, 50 hp.
19. 24"x12' 9" Wemco classifier, 1½ hp.
20. 26'x8' Wemco thickener, wood tank, 1 hp.
21. 9" Link-Belt screw conveyor, 1½ hp.
22. 8'x3½' cylindrical steel surge bin, 8 tons capacity
23. Medium drainage sump
24. 4" Wemco medium circulation pump, 25 hp.
25. Merrick pivoted Weightometer, ¾ hp.
26. 12"x7" Link-Belt float elevator
27. Alnico magnetizing blocks, ½ hp.
28. 16'x6' Dorrco medium thickener, 3 hp.
29. 18'x24' wood-stave float bin, 300 tons capacity
30. 2" Wemco medium underflow pump, 7½ hp.
31. 3"x3" C. AC sand pump. 230 gpm. 7½ hp.
32. 12" Dings magnetic separator, 3 hp.
33. 30"x18" Wemco medium densifier, 3 hp.
34. 1½" Deco vertical sand pump, 3 hp.
35. Penn demagnetizing coil
36. Minus 100-mesh ferrosilicon.

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2.80. These facts suggested that gravity concentration methods might offer a solution of the problem. Out of the study made came the decision to install a sink-and-float unit to preconcentrate the mill feed ahead of grinding and flotation.

Advantages of Change

Preliminary estimates indicated that the use of Heavy-Media concentration would have these advantages:

1. Flotation feed would be enriched by the rejection of 25 to 30% of the original tonnage as a coarse aggregate, suitable for road surfacing, with a loss of about 5% of the valuable mineral.

2. Sulphides in the head feed would be concentrated into smaller volume, making it easier to scalp off these impurities.

3. Cost of operating a Heavy-Media plant would be low and would be offset in part by economies to be made in the grinding and flotation sections.

4. Over-all mill recoveries would not be affected by the wide variations in head-feed grade as had been the result when straight flotation was used.

With these benefits, it appeared, the mill operations would be flexible enough to permit the mining department to work narrower veins and by so doing increase the ore reserves. Also these reserves might be further increased by finding small bodies of higher-grade ore which otherwise would be lost or else found only as the result of an expensive prospecting program.

Continuous Operation

The Heavy-Media separation unit selected was designed for one-man control and for continuous operation as a part of the entire plant. This feature eliminated the need for storage bins ahead of flotation. Construction was complicated by the need of building in a confined area subject to floods from the Ohio River, also by the need of receiving ore from a fixed point and of returning the sink product to the same place. As completed, the design provided for a main operating floor with all electric and air controls within easy reach of the operator, two sub floors and a basement which drains to one central clean-up elevator. The building is of structural steel, sided and roofed with corrugated aluminum.

Ore is received in trucks and is weighed, sampled and sent to a stockpile for storage. The pile is so arranged that one side is being built up while the other side is being reclaimed by a scraper. This practice effects a blending which assists in keeping mill heads uniform. Reclaimed ore is crushed in a hammer mill and conveyed to a 250-ton steel crude-ore bin from which it is delivered by an apron feeder to a vibrating screen where trash and plus 2-in. material are removed and sent to waste. Screen undersize is elevated to the top of the building and discharged onto a 3 x 10-ft. double-deck low-head vibrating screen used as a primary washing screen for separating the minus 10-mesh fines.

Washing-screen undersize goes by launder to a 24-in. x 12 ft. 9 in. spiral classifier for removal of coarse sand. This sand is combined later with the sink product of the cone to make the ball-mill feed, ahead of flotation. Classifier overflow is thickened in a 26 x 8-ft. thickener, the overflow is discarded and the underflow is pumped direct to flotation.

The Cone

Oversize from the primary washing screen is treated in a Heavy-Media separatory cone, 10 ft. in diameter, having an outside air lift. Separation is made in a ferrosilicon-water medium with apparent specific gravities of 2.55 and 2.85 as the respective top and bottom gravities. Both sink and float products are sent over two center-partitioned 4 x 10-ft. low-head vibrating screens in series. The first screen is used for drainage, the bulk of the medium being drained off and sent to a sump for return to the cone. The second screen is used under washing sprays for the removal of the medium which adheres to the ore. The float product is elevated for discharge into an 18 x 24-ft. wood stave tank on a concrete base, fitted with bottom draw chutes for truck loading.

Recovering the Medium

Medium washed from the ore is passed between two permanent magnets and fed to a 16 x 6-ft. heavy-duty thickener of special design. The overflow is re-used in the sprays over the medium washing screen. The underflow is pumped to the first of two 12-in. magnetic separators for recovery of ferrosilicon. Tailings from this separator pass to the second separator, the tailings of which in turn are pumped to the 24-in. classifier, which handles the minus 10-mesh fines from the primary washing screen.

Cleaned medium from the first magnetic separator is discharged into a 30 in. x 18 ft. densifier for dewatering and feeding back into the circuit. Ferrosilicon from the densifier is passed through a demagnetizing coil on the way to a sump under the medium-drainage screen.

Two Products

The plant makes two products, a "float" which is discarded as a tailing, and a concentrate, or "sink" product, which is sent to a standard flotation plant for the production of a fluorspar concentrate. The tonnage of crude ore fed is obtained from a Weightometer, and the head-feed analysis obtained, for each shift, from samples cut each 30 minutes. Float rock or tailing samples are cut each hour and assayed for each shift. A check is obtained daily on the float-rock assays, all "float" drawn for disposal being weighed and sampled. As the flotation-plant feed is the concentrate from the plant, the operators are able to compute their recoveries from the standard mill formula of

$$\frac{C(H-T)}{H(C-T)} \times 100\% = R\%$$

Results Check Estimates

Operating results compare favorably with preliminary estimates, these having been either equaled or bettered. Tailings losses have been decreased. A recovery of 97 to 98% is being made, with the rejection of the original mill feed averaging 25% by weight. Ferrosilicon consumption is estimated to be 0.25 lb. per ton of crude ore, although with longer operating experience this figure may be changed slightly. The management believes the installation has justified the reasons for which it was made.

We acknowledge with thanks the assistance received from Western Knapp Engineering Co. for their work in drawing the plans, for the erection of the building and the installation of the equipment. Thanks are due also to American Cyanamid Co. for advice and assistance in preparing the plant flowsheet, the selection of equipment and the services of technical assistants who started the plant and instructed us in its operation.

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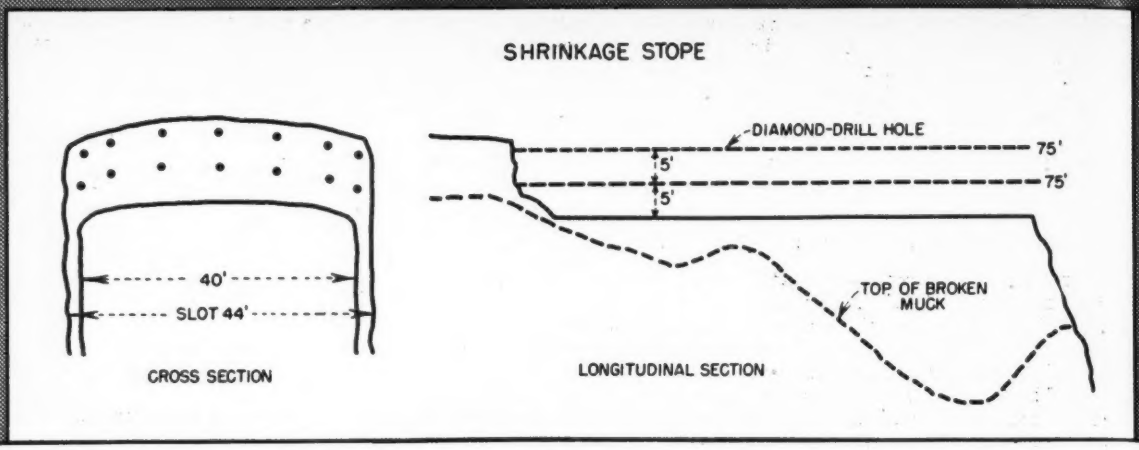

DIAMOND DRILLING. About 27 shifts are required to drill and blast a block 10 ft. high by 40 ft. wide by 75 ft. long.

Appraising the Hidden Values

C. H. HOPPER
Mining Engineer
Boyles Bros. Drilling (Eastern) Ltd.,
Kirkland Lake, Ontario

WHEN THE PRICE of drilling bortz increased 100% more than a year ago the cost of blasthole diamond drilling also increased in proportion to the diamond loss at each particular job. The cost per foot in softer ores mounted about 10% with negligible effect on cost per ton, but the hard gold ores suffered an increase of about 30% and many operators became fearful that diamond drilling could not maintain a competitive position in primary breaking as compared with percussion drills. Their fears have not been borne out; in fact a number of mines with hard ore continue to use blasthole diamond drilling for primary breaking. At most of these mines diamond drilling costs range up to $1 or more per foot whereas percussion drilling costs about 25c a foot. The fact that the two methods can and do compete at some of the mines suggests fundamental differences of a high order. The object of this paper will be to develop and measure those differences.

In general, safety features, dust control, high tonnage with a small crew or, in the case of sub-level mining methods, savings in development by virtue of greater sub-level intervals favor diamond drilling and these features are recognized by the mining industry. However, there are a number of other, more obscure values that show up to better advantage if features related to mining method are disregarded and a comparison is drawn between diamond drills and percussion drills on a strictly defined unit-cost-of-breaking basis. About the only place that diamond drills and percussion drills meet on common ground to do such a job is in breasting operations in large shrinkage stopes. For the purpose of this paper a hypothetical shrinkage stope at a large low-grade gold mine will be assumed to have reached the stage where a breast 10 ft. deep has been established and a block 40 ft. wide by 75 ft. long remains to be drilled off and broken, using either percussion or diamond drills.

Competitive Conditions

In preparing the accompanying tabulation, the writer has selected conditions where diamond drilling and percussion drilling could be competitive and give the same direct primary breaking cost in a shrinkage stope. The tabulation is intended to be illustrative rather than representative because some mines use longer steel and others break more per foot than the example chosen. There are so many variables that each mine operator will have to substitute his own figures based on measurement of actual hole drilled and costs, which include the same items in both cases. In the case of percussion drilling in hard ores, bit wear will seldom allow steel longer than eight feet to be employed and many holes four feet in length and shorter are likely to be used in the lower part of the breast and for blockholing the large blocks that tend to peel off ahead of each shot. Therefore, the average length of hole has been assumed to be six feet.

Some mines break a ton or better for each foot drilled, but a more common factor of .85 tons per foot has been chosen. A production of 70 tons per machine shift and explosives cost of 9c a ton is considered good breasting at most gold mines and under similar circumstances diamond-drill holes can usually be counted on to break 3 tons per foot and 115 tons per machine shift at about 5c a ton for explosives.

Normal breasting is characterized by a full cycle of operations on each shift. Steel is brought in, the travelway and working place are scaled and inspected for missed holes, the muck pile is levelled, the equipment is located, carried to the working place and set up, air and water lines are laid, cleaned out and connected, and the shift boss inspects the working place, comments on the location of holes and determines what chutes may be pulled without disturbing the setups or causing difficulties on following shifts. Usually less than half the eight-hour shift is available for drilling because time must be allowed at the end of the shift to tear down, carry equipment to a safe place and cover it, blow out the holes, get the explosives, and load and blast in time to get the used steel out to the station and catch

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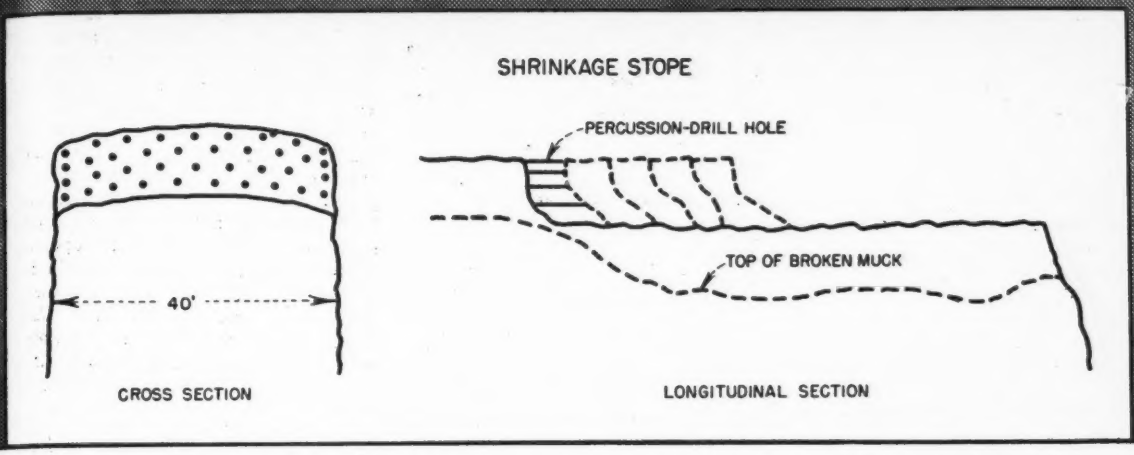

PERCUSSION DRILLING. Fourteen 6-ft. shots and 44 shifts may be necessary to advance the 10-ft. high breast 75 ft.

in Blasthole Diamond Drilling

the cage at the end of the shift. Usually two men constitute a drilling crew, although one helper may sometimes serve two machines at the same time.

A breast about 10 ft. in depth may require 4 rows of holes with an average burden and spacing of 2½ ft. by 5 ft. Blockholing ahead of the breast gives the equivalent of another row. The determining factor for the burden is not the breaking ability of the loaded holes but rather the shearing ability of the powder at the bottoms of the holes. The top row or rows of holes may bootleg excessively if more burden is placed on the holes and this factor is responsible for the fact that fourteen 6-ft. shots may be required to advance 75 ft. That the full breaking ability of the hole is not utilized is proven by the frequent use of spacers to cut down on the powder load in the barrel of the hole. In other words, holes are drilled and powder expended for a job of shearing a tight end, and the rock is broken incidental to that job. The same amount of powder, perfectly confined and located, might break two or three times the tonnage, because the degree of confinement and theoretical emplacement for breaking in a 6-ft. hole is not very good. The force of the gases is too easily released and certainly any powder placed in the two feet nearest the collar would be wasted.

Comparative Drilling and Blasting Data

	Percussion Drilling	Diamond Drilling
TONNAGE (10 ft. by 40 ft. by 75 ft.)	3125	3125
DRILLING DATA		
Feet of hole required	3700	1050
Average length of hole, feet	6	75
Diameter of hole drilled, inches	1⅝ to 1¼	1½
Cost per foot drilled	$0.25	$1.00
Number of drilling and blasting shifts	44.5	27.25
Footage per drilling and blasting shift	83	40
Tons per drilling and blasting shift	70	115
Tons per man shift	35	75
Tons per foot drilled	.85	2.96
Estimated time of scaling, setting up, tearing down, moving, and steel handling, hours	130	30
BLASTING DATA	Rotation	Instantaneous
Type of blasting	cap and fuse	electric
Number of blasts	22	1
Condition of back	rough	smooth
Type of powder	40% forcite	75% forcite
Size of cartridges	1⅛ in. x 8 in.	1¼ in. x 8 in.
Cost per pound of explosive	14c	17c
Feet of hole loaded	2460	1020
Percentage effective hole	66.6%	97%
Powder requirement, lb.	1670	867
Powder requirement, lb. per ton	.534	.278
Powder requirement, lb. per foot drilled	.452	.825
Powder requirement, lb. per foot loaded	.678	.850
Number of electric blasting caps	0	14
Number of No. 6 blasting caps	620	0
Number of feet of fuse	5000	0
Number of cartridges of clay stemming	1240	28
COST PER TON		
Direct labor	$.178	$0.84
Bits, supplies, air and general	.117	.252
Powder	.075	.047
Fuse and caps	.014	.001
TOTAL	.384	.384

Rotation firing with use of cap and fuse is a little cheaper and perhaps more convenient for this class of work than instantaneous electrical detonation. Rotation shooting tends to knock down some slabs ahead of the section drilled and, where many slips are present, cut-off holes may also result. Instantaneous electrical blasting may improve fragmentation in the section drilled and loaded and eliminate cut-off holes, but the shock of the bigger blast also tends to peel off larger slabs ahead.

An entirely different and much longer cycle is followed in diamond drilling. One point that cannot be overlooked at the outset is the usual necessity of preparing or starting a breast with percussion drills. This particular feature is outside the scope of this paper by reason of the fact that the breast is assumed to

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be established in these two cases.

Once a travelway is made available, the working place scaled, and the equipment set up with air and water connected, the diamond-drill crew is ready for 25 shifts of drilling followed by 1 shift of loading. With two drills working helpers are not usually required, although sometimes one helper will serve both drills. Supervision is at a minimum and the shift boss does not have to be as careful about drawing broken much ahead of the breast. The holes are spotted accurately by the engineering department on the basis of the experience they have had with shots previously made.

As the long holes have no shearing to do (except at the bottoms) the burden and spacing (5 ft. by 8 ft. to 6 ft. by 10 ft.) are chosen entirely according to the breaking ability of the hole, which is densely loaded with high-strength explosive almost perfectly confined. If the ends of the holes do bootleg they can be reblasted, but a 12-in. bootleg means nothing because it is not cumulative in effect. A series of blasting advantages add up to give enormously more effective blasting per foot of hole drilled. Some of the advantages can be measured fairly accurately. The others can be estimated as follows:

	Advantage Over Percussion Drilling
Accurate spotting of holes by engineers	20%
Pounds of powder per foot drilled	87%
Effect of 75% forcite over 40% forcite	10%
Effective confinement	20%
Effective burden for breaking only	93%
Instantaneous detonation	20%
	250%

The above estimate happens to correspond exactly with the breaking experience indicated by the comparative figures in the tabulation: 2.98 tons per foot of diamond-drill hole and 0.85 ton per foot of percussion drilling. The advantage is 3½ to 1 or 250% in favor of the diamond drills, lending credence to the estimate of the six reasons for this extraordinary performance. When the saving in powder cost alone is balanced against the cost of drilling, it is seen that the blast-hole drilling can cost four times as much per foot and still remain in the competitive range.

The difference in supervision as between daily visits by the shift boss and longer-term planning by the mine superintendent and the engineering staff has been mentioned before. The fact that only half as many men are required to produce a given number of tons will be reflected in housing requirements, compensation charges, unemployment insurance, and various services. From the safety standpoint there are many advantages in diamond drilling. Accidents are more or less in proportion to exposure and frequency of repetition, both of which are greatly reduced because scaling is a minor operation confined to one place and blasting is required only once a week. Also, both the drilling and the blasting result in an appreciable reduction of the harmful dust particles carried in the mine atmosphere.

The primary purpose of this paper has been to show that long diamond-drill holes, when used for blasting, are three to four times as effective as the same footage of short percussion drill holes. In hard ores, diamond drilling is comparatively so expensive that it is rarely competitive under shrinkage stoping conditions. The same blasting efficiency is operative, however, when the long diamond-drill holes can be employed in a sub-level system where ring drilling can cut the drilling cost and where continuity of operation, a drilled-off reserve, and a high degree of safety are assured.

Russian Mills Seek Improved Techniques

LAGGING PRODUCTION of certain mines and falling recoveries in various mills are the chief worries of the Soviet non-ferrous metals industry, according to Robert Magidoff, McGraw-Hill World News correspondent in Moscow, who reports as follows:

Though total output of copper ore increased in 1946, the increase could have been much greater if it were not for a lag in production of the Ural copper mines. Plans are therefore being made to introduce high-speed drifting methods (jumbos), electric locomotives for haulage, and scraper loaders in the Ural Jezkazgan and Kounrad copper mines. More powerful explosives will be used.

Quality of the work of a number of concentrators had fallen off considerably during the war. For example, copper recovery at the Krasnouralsk mill was 80.2% in 1946 against 88% in 1940. Zinc mills have done badly; the Leninogorsk (Altai) plant made a zinc recovery in 1946 of 67.5% against 77% in 1940. The mills serving the big new Chimkent lead refinery are handicapping this plant by the poor quality of the concentrate sent to it. Every effort is being made in 1947 to improve results at these and many other mills by introducing improved flotation reagents and equipment and by other methods such as automatic control of milling processes. Lead-copper differential flotation will be tried this year at the Leninogorsk mill and the Belousovka plant. Denver jigs for recovering free gold will also be tried in the former mill. The Denver-Buckman tilting concentrators (developed at Consolidated M. & S. Co.'s Sullivan mill) will be put in this year at the Khapcheranga mill (Chita Province) and in the Sinanchin tin mills with the purpose of increasing tin recovery about 2% and saving some labor.

The following are regarded as the most important tasks set for the Soviet non-ferrous meetals industry in 1947:

Copper. Construct the "giant" Jezkazgan copper mining and smelting center in Kazakstan, where ore reserves are reputed to be second only to Chuquicamata. Develop orebodies and devise treatment methods for copper ores of Almalyk district (Uzbekistan), the Kajaran district, and the Kounrad copper mine near Lake Balkash.

Light Metals. Develop methods for extracting alumina from nepheline, found in immense quantities on the Kola Peninsula. Improve production of higher grades of aluminum.

Nickel-Cobalt. Complete restoration of Severonickel plant on the Kola Peninsula, with particular attention to its cobalt department. Improve quality of South Urals nickel; cut percentage of copper in it.

Tin. Launch new projects in the Far Eastern Maritime and Khabarovsk Provinces.

Tungsten-Molybdenum. Special attention to Tyrny-Auz mine and mill in the Caucasus and the molybdenum mines of Chita Province. Increased recovery and improved grade of all concentrates.

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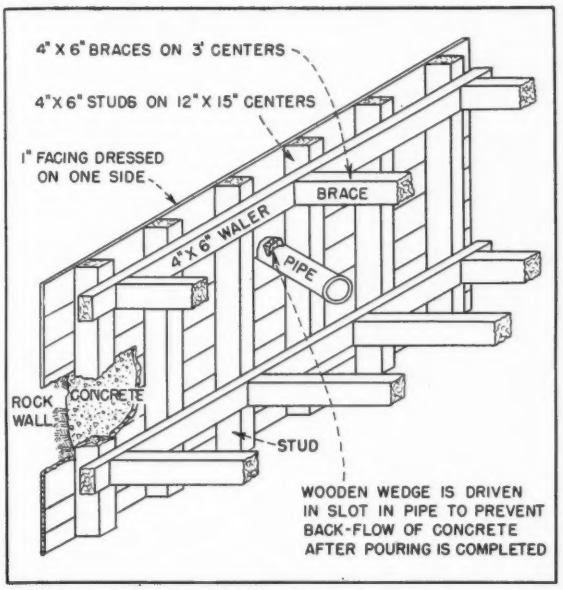
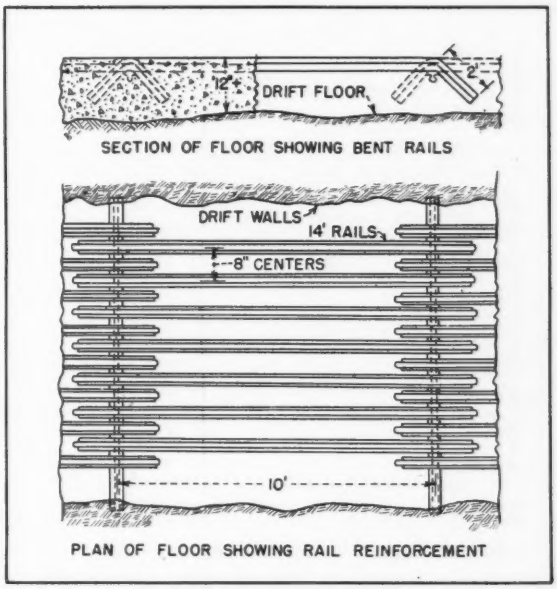

4" X 6" BRACES ON 3' CENTERS
4"X 6" STUDS ON 12"X 15" CENTERS
1" FACING DRESSED ON ONE SIDE
BRACE
4"X 6" WALER
PIPE
ROCK WALL
CONCRETE
STUD
WOODEN WEDGE IS DRIVEN IN SLOT IN PIPE TO PREVENT BACK-FLOW OF CONCRETE AFTER POURING IS COMPLETED

CONCRETE FORMS are constructed of 1x8-in. and 4x6-in. timber. Rock wall serves as outside form except for ventilation doors.



SLUSHER-DRIFT FLOOR DETAILS. Ends of rails are bent downward to prevent scraping rocks from picking up floor.

Mine Concrete Poured With Portable Machines

LEWIS D. ANDERSON
Leadville, Colo.

BY USING portable machinery to place concrete, and scientific methods to prepare batches, Climax Molybdenum Co. has developed an inexpensive, fast, and effective system for constructing underground support.

Generally speaking, the concrete conforms to the current standard specifications of the American Society for Testing Materials. Portland cement, fine and coarse aggregates, and suitable chemical-free water are used as ingredients of the concrete.

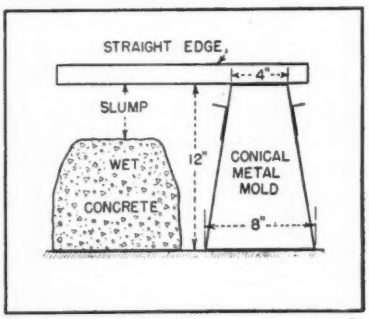
Selection of a proper fine aggregate is very important. Fine aggregate is sand, stone screenings or certain special materials which will pass through a 4-mesh sieve. In general, at least 95% of fine aggregate, when dry, should be retained on a 100-mesh screen. Climax used sand that runs from 93 to 98% plus 100 mesh. For certain long pumping jobs; a sand may be used that contains up to 4½% of minus 200 mesh. These slimes act as lubricators for the wet concrete, but call for more water, thus giving a weaker concrete.

Four tests should be made to determine the suitability of an unproved sand: (1) a colorimetric test to determine the amount of organic impurities, (2) a decantation test to determine the quantity of silt and clay, (3) a sieve analysis to determine the grading, and (4) tests for tensile and compressive strengths after curing periods of 7 and 28 days.

Four Tests to Be Made

The colorimetric or organic test is made to determine the amount of tannic acid present in the sand. Four and one-half ounces of sand are placed in a graduated bottle. A 3% solution of caustic soda (NaOH) is added to raise the level to 7 oz. The bottle is capped and shaken vigorously, then allowed to stand for 24 hrs. At the end of this time, if the solution is clear or faintly colored, the sand is usable. If the solution has a definite dark color, the sand should not be used until subsequent tests show the presence or absence of coal, manganese, or color-producing mineral. If color is found to be organic, the sand should not be used.

The decantation or loam test is made to determine the quantity of very fine particles (minus 100 mesh) in the sand. A sample of sand is thoroughly dried and weighed. This dry sand is placed in a container, covered with an excess of water, mixed thoroughly and allowed to stand for a few minutes. Some of the very fine particles, which by themselves would readily pass through a No. 100 sieve, but which in the sand were loosely cemented together to form conglomerate grains too large to pass through the No. 100 sieve, will dissolve or remain in suspension in the water. After the mixture has settled, the water is poured off, and the process is repeated until the wash water is clear. The sand is then thoroughly dried and weighed, and the percentage of lost material is computed. A sand showing more than 3% loss by this decantation test is discarded except for special



SLUMP TEST is made by filling mold with three equal-volume layers of concrete. Each layer is tamped. Last layer is struck off even with top of mold. Mold is removed, and amount of slump measured after concrete has settled.

Compressive Strength of Various Concretes at 28 Days
(In pounds per square inch)

AGGREGATE	1:1:2	1:1½:3	1:2:4	1:2½:5	1:3:6	Weight in lb. per cu. ft. (1:2:4)
Granite trap rock	4,000	3,300	2,600	2,100	1,600	160
Gravel, hard limestone and hard sandstone	3,400	2,800	2,200	1,700	1,400	155
Soft limestone and soft sandstone	2,200	1,890	1,500	1,200	1,000	143-148
Cinders	800	700	600	500	400	112

jobs which permit use of the sand.

The sieve test is made to determine the grading of the sand from which the fineness modulus is found. The sample is thoroughly dried, weighed, and passed through the following screen series: Nos. 100, 48, 28, 14, 8, 4, and ⅜ in., ¾ in., 1½ in. and 3 in. The fineness modulus is the sum of the percentages retained on each sieve divided by 100. Sands with a fineness modulus value less than 2.4 are rejected.

For the tensile and compressive tests, briquettes are made from the unproven sand, and cured in water for seven days. These are then sent to a testing laboratory in Denver. Some briquettes are tested upon arrival and others cured for a total of 28 days in a water bath. Compressive strengths of 4,000 lb. per sq. in. have been obtained with the present supplies of sand.

Smooth Aggregate Best

In selection of the coarse aggregate, a well graded, smooth material should be chosen. This should have a maximum size of 1½ in. and a minimum of 3/16 in. (No. 4 sieve). Crushed pebbles, stones, or other materials such as blast-furnace slag or mine chats are usable, but not preferred to river or natural gravel. The material must be free from organic material. Flat, elongated particles are unsuitable. Climax is now using a crushed aggregate obtained from a glacial drift deposit.

Water should be clean and free from oil, strong acid and alkali, organic matter, or other deleterious substances. The water reacts chemically with the cement to produce a collodial coating on the aggregates. This coating does the actual cementing. Additional water is needed for workability and placing of the cement. The more water added, the weaker the concrete becomes.

For underground work, a satisfactory mixture can be made with 5 to 7½ gal. of water to six bags of cement, and will give a compressive strength of 3,500 lb. plus. This amount should be varied with the amount of moisture in the aggregate to give a slump test of three to five in. for tunnel linings or mass concrete. Because outside stockpiles are unprotected from rain and snowfall, and are thawed with live steam in the winter, the material here carries approximately 10% moisture.

The slump test indicates the consistency of the concrete. It is made with a metal mold set on a flat, non-absorbent surface, and filled with three, equal-volume layers of freshly-mixed concrete. Each layer is tamped with a ⅝-in. round rod twenty-five times for each layer. More than twenty-five tamps will give less slump, while less than twenty-five tamps will give more slump than standard. The last layer is struck off to fill the mold exactly, and the mold is removed. After the molded concrete has settled, the measured distance in inches it has settled, below the top of the mold, is termed the slump. See illustration.

Ground Support

Concrete lining gives a longer life to a drift or draw-hole than the bare rock. It can be replaced and built up to the original shape or form, and often gives the arch and walls of a drift greater compressive strength than when primarily driven. This holds true if the country rock is a fault breccia or some other soft formation. If filled solidly to the rock, concrete holds better than timber because it prevents the exposed faces from sloughing and airslacking.

Structural failure often occurs where timber forms are placed between the concrete and the rock. This may be due to the swelling or decaying of the timber caused by moisture. Excess ground water carrying certain sulphates or acids can often cause rapid decomposition or failure. Adequate weep holes, placed along the bottom of the walls, will prevent this. Most ground water may be beneficial because it lengthens the curing period.

Portable Machinery

Portable machinery is used for this concrete work. All pieces of the heavier equipment are mounted on mine car wheels for 36-in. gage track. Power is furnished from the 275-volt d.c. trolley wires. This portable machinery consists of three batch cars, batch concrete mixer, conveyor belt, concrete pump, trolley motor, and various flat cars.

A 24-compartment batch car is filled with a weighed amount of sand and gravel mix, and one compartment is filled with sand for grout. This amount of sand and gravel will make one one-half yard batch in the mixer. The bottom of each compartment is closed with a slide. Each car has a conveyor belt powered by a geared, 5-hp., d.c. motor that carries the batch aggregate from the compartment slide to the mixer hopper. From the end of this belt the mixture of sand and gravel is dumped into the hopper of the mixers. Three bags of cement are added by hand to 655 lb. of sand and 750 lb. of crushed gravel. From the hopper, this material is dumped into the rotary mixer, and a predetermined amount of water is added to give the concrete a desired slump. A Rex, ½-yard mixer powered by a 10-hp., d.c. motor is used.

Wet concrete is dumped on an inclined, 15-ft. conveyor geared to a 3-hp., d.c. motor. From the end

of this conveyor, the concrete drops in a 7-in. Rex pumpcrete powered by a 25-hp., V-belt drive motor, which forces the concrete through 6-in. toggled pipe into the forms. The concrete is thoroughly mixed in the mixer for three minutes and slightly longer while passing through the pump. Occasional hammering on the forms is sufficient to eliminate any air voids in the concrete.

The last piece of pipe has one straight end that is placed inside the forms. When the cavity is filled, a hole is cut in this pipe close to the form. A wooden wedge is driven tightly in the pipe to stop the back flow of the wet concrete. See illustration. After the forms have been removed, this pipe is cut off close to the concrete with a torch. A small pipe is sometimes placed through the forms to the back of the area to allow any entrapped air to escape. This is necessary if there is a low ledge near the forms with higher voids behind it.

How Pipes Are Cleaned

After a form is filled or a shift has ended, empty paper cement sacks are placed in the pipe close to the pump. The back-flow is stopped by placing iron pins in a special slot in the pipe, and then by stuffing sacks through an opened joint. The pipes are rejointed, pins are removed, and water is then pumped through the pipes. The tightly wadded sacks and the water clean the pipes very effectively. If a form is filled, the concrete in the pipe is spilled on the ground.

For placing the concrete, a wooden form is used on one side, and the rock on the other. Wooden forms are used on both sides for ventilation doors. Facings of the forms are made of one-inch material dressed on one side. These are backed with 4x6-in. studs on 12 to 15-in. centers, depending upon the quality of the one-inch material. In addition, 4x6-in. wales are placed three feet apart behind the studs, and 4x6-in. braces, spaced three feet apart, hold the wales. This spacing may be shortened at the bottom of a form to compensate for the hydro-static pressure of the concrete. Most of this material is salvaged and reused. See illustration showing form construction.

Forms are left in place for at least 24 hr. to allow the concrete to set enough to hold its own weight. Because of a fairly constant temperature of 45 deg. F., curing of the concrete is no problem. Ground water causes little trouble and few provisions are necessary for its removal.

Slusher drifts and fingers are lined with a minimum of 12 in. of concrete. The drifts are driven 9x12 ft., and concreted down to 7x10 ft. Sides of a drift are poured first. Approximately three feet are poured on one side, then five feet on the other, seven on the first, and so on until the sides are poured. Then the back of the drift is poured. This step method of raising the sides helps balance the side pressure and keeps the forms from moving until the concrete has set. The bottoms of drifts are reinforced with 60-lb. rails. See illustration.

Different patterns and methods have been tried and abandoned. For example: slusher drifts were inclined from the fingers to the draw hole—too much danger of rocks rolling on the men; fingers going out both sides of drift—weakened pillar over draw hole; rails laid in herringbone pattern for reinforcing slusher drift bottoms—too easy to tear rails out of concrete during scraping operations.

How to Determine Proper Proportions of Cement, Water, and Aggregate

If there are no air voids in a wet concrete (tests have shown this to be true), the resultant volume of the concrete is equal to the absolute volume of the cement plus the absolute volume of aggregate, plus the volume of water used.

Absolute volume of one sack of cement is 0.487 cu. ft. of solids (or .5 for our problem).

6 sacks of cement to one yard of concrete × .5 = 3 cu. ft.

7½ gal. or 1 cu. ft. of water per sack × 6 = 6 cu. ft.

9 cu. ft. from 27 cu. ft. leaves 18 cu. ft. of sand and gravel.

The sand and crushed glacial drift coarse aggregate has a specific gravity of 2.59 which is somewhat lighter than river gravel and sand.

Sp. Gr. × Wt. of 1 cu. ft. of water × cu. ft. = Wt. of sand and gravel. 2.59 × 62.4 × 18 = 2,909.028 or 2,910 lb.

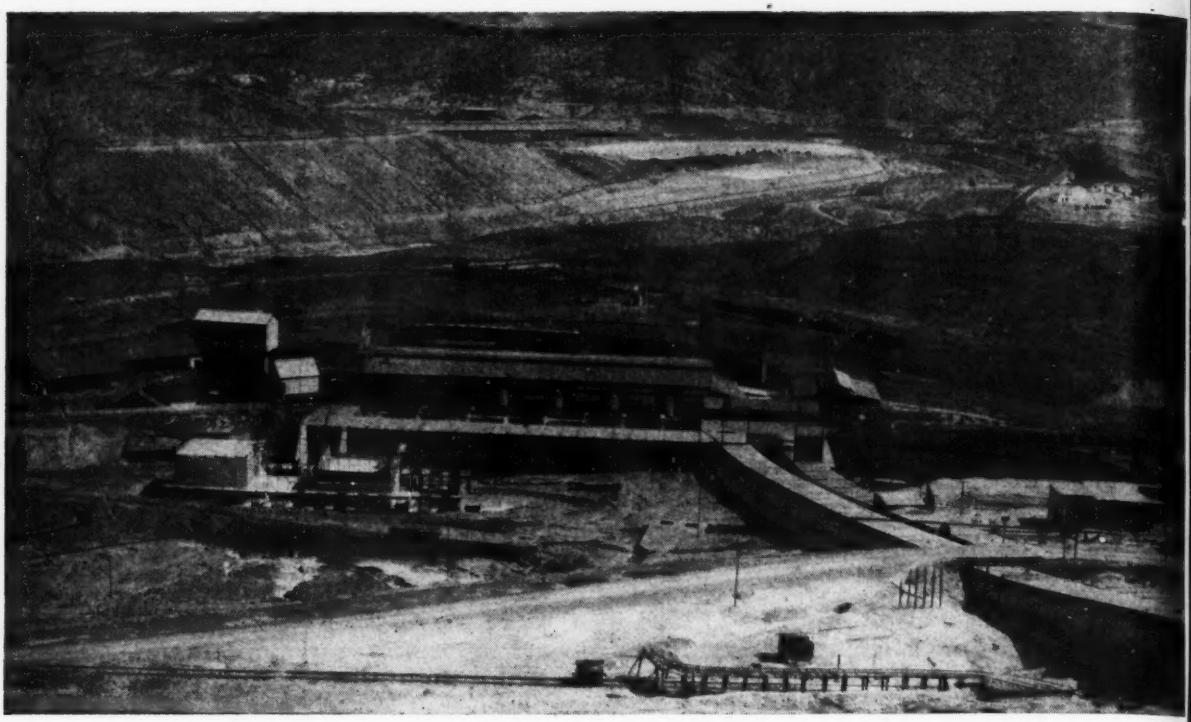
Using 45% sand and 55% coarse aggregate which laboratory tests have proven to give the strongest concrete with these local aggregates, we get 1,310 lb. of sand and 1,500 lb. of gravel. Half of each of these weights is mixed and placed in a compartment of the batch car and will give one-half cubic yard of concrete when mixed with the cement and water in the Rex mixer.

Developing Newest Lead Discovery

The current, and probably continuing, world-wide shortage of lead gives added interest to recent reports of developments at the Tanganyika (Africa) properties of Uruwira Minerals, Ltd., where a lead orebody of considerable size was discovered some months ago by J. de la Vallee Poussin, Belgian geologist, and managing director of the company.

Uruwira Minerals, Ltd., has 47 square miles of the Tanganyika Territory under lease, and has applied for a third lease that would bring the total holdings up to 71 square miles.

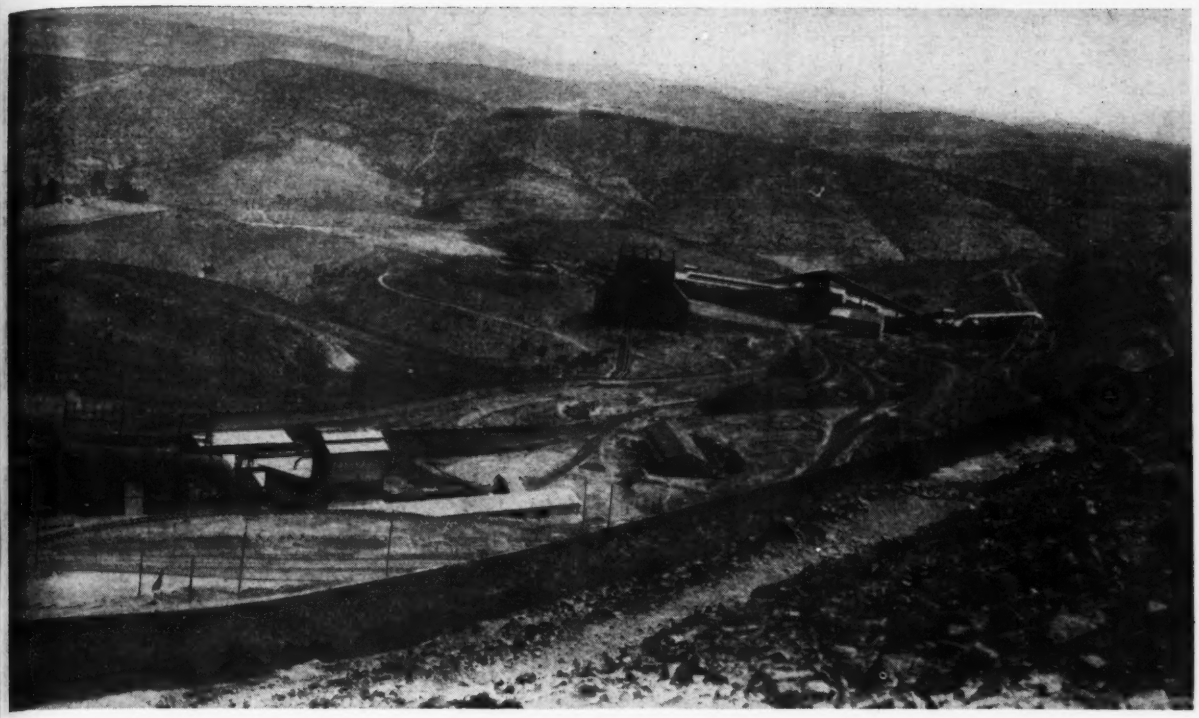
The lead orebody lies approximately 60 miles east of Kigoma on Lake Tanganyika (see E&MJ. April, 1947, page 152). Underground development on the orebody totals approximately 10,000 ft. on two levels about 110 ft. apart vertically. Winzes have been sunk from the lower level to a total depth of 350 ft. Ore is found in a shear zone for 1,100 ft. along the strike, and for the total depth thus far explored. Diamond drilling shows ore down to at least 1,200 ft. Approximately 250,000 tons of "probable" ore has been developed. Grade runs 8½% lead, 1% copper, 4 oz. silver, and 1 dwt. gold. Union Corporation is technical manager for the company, and plans to begin work on a pilot plant soon with the H. & H. Sink-Float process. Development will cost about £1,250.000.



THE MOST MASSIVE copper-bearing pyrite orebodies in the world are worked by Cia. de Rio Tinto in the Huelva district.

RIO TINTO'S ATALAYA CUT exposes massive pyrite over 400 meters vertically. Maximum width is 280 meters, average 80.

XUM



RIO TINTO operates a copper flotation mill (above), and a copper smelter (opposite), also wins copper by heap-leaching.

Mining in Spain's Huelva District

ANDRES HERRERO ALEIXANDRE
Madrid, Spain

CONSIDERING that nothing aids international accord like mutual acquaintance, one ought to do his best to help further the acquaintanceship between countries by fostering in each some knowledge of the other.

It is in this spirit that I hope eventually to offer readers of *Engineering and Mining Journal* a broad view of present mining activities in Spain, a nation rich both in the mining tradition and in actual mineral wealth. For example, there is mercury, of which Spain has probably the richest and most abundant ores in the world. No less well-known are the pyrite deposits of Huelva, the iron orebodies near Bilbao, the potash deposits of Catalua and Navarra, and the lead orebodies that occur in various parts.

This first article will deal solely with the mining district of Huelva, inasmuch as it seems preferable to review Spanish mining by districts rather than by minerals or methods.

The distinguishing characteristic of the Huelva region is the presence of enormous masses of iron pyrite, with which is associated chalcopyrite and some secondary chalcocite and covellite. A sedimentary origin was once postulated for these masses, but more recent thinking on the problem takes the view that they are of magmatic origin.

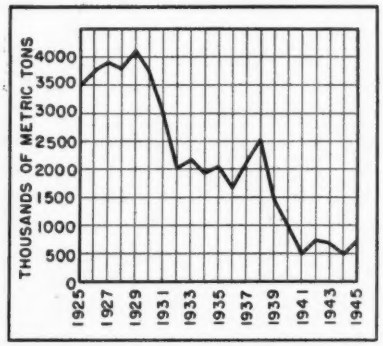
Probably the genesis of the orebodies included four processes. Some of these large masses of pyrite were formed at depth by magmatic segregation, and crystals of chalcopyrite, solidifying later, were scattered among the pyrite grains. Other pyrite-chalcopyrite masses, solidifying at depth, appear to have been subjected to hydrothermal action. Still other orebodies, of the vein type, are rich in blende and galena as well as pyrite, and they appear to have been formed by hydrothermal action alone. There are also quartz stringers of hydrothermal origin that are rich in copper and in arsenic and antimony sulphides.

Certainly all four of the foregoing deposits are present in the Huelva district, and their genesis may be explained by applying recognized physico-chemical principles.

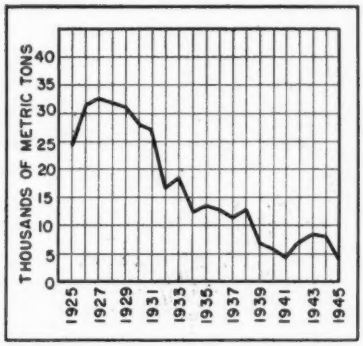
In addition to supplying copper and sulphur from the pyritic orebodies, the Huelva district produces gold and silver, manganese, and iron ore. There are also deposits of graphite and asbestos, which are not now worked for lack of enterprise capital. Antimony and lead are found there, but the extent of their deposition has not been determined.

Pyrite is the most important mineral mined by the largest company in the district, Cia. de Rio Tinto, Ltd. This company mines what is perhaps the largest mass of pyrite in the world. Its depth is unknown, yet in the Atalaya pit, a depth of 400 meters is exposed and another 100 meters indicated by drilling. Maximum width of this mass is about 280 meters and average width is 80 meters.

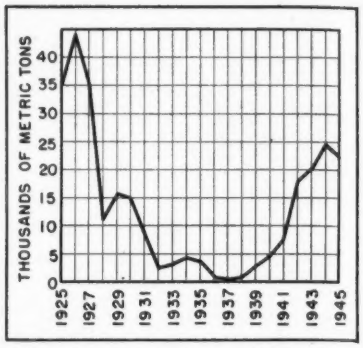
Next in importance are the pyrite deposits mined by Cia. de Tharsis and the Soc. Francesa de Piritas de Huelva. Also mining pyrite here are the Soc. Minera del Guadiana and the Soc. Arrendatarios de San Telmo. The Union Espanola de Explosivos hopes to open two new



PRODUCTION of pyrites has fallen off since 1938, as is manifest in this graph, because of the drop in export demand.



COPPER ores have grown leaner with depth. Drop in 1945 was caused by shortage of coke and electric power.



MANGANESE ores are low grade in Huelva. Output increased since 1938 because foreign ores could not be imported.

mines as soon as it completes a new explosives factory in the district.

Copper is not mined exclusively by any one company, and all the aforementioned mines supply some copper. Rio Tinto, for example, has some ore high enough in copper to be smelted for blister copper, but most of its copper is won by the heap-leaching process well-described in the literature. The same process is used for copper by all the companies, although Rio Tinto is the only one using smelting furnaces. Rio Tinto also treats 1.5% copper ore by flotation to get a 14% concentrate that is briquetted, dried, and smelted.

Gold and Silver are now produced in the district only in the cyanide plant of the Cia. de Tharsis. Between 1938 and 1944, production of this company was 1,846 kg. of gold and 9,416 kg. of silver. Rio Tinto abandoned gold production in 1942 to concentrate its men and equipment on copper production.

Manganese has been mined in Huelva only recently, compared, that is, to the ancient beginnings of pyrite mining. Rich deposits of pyrolusite have been worked off and on since 1858, the peak production coming in 1900, when 112,000 tons was mined.

Following a long decline, manganese output rose when the war began because of the difficulty of importing foreign manganese. Since 1945, production has fallen off because of a shortage of electric power induced by a drought. Despite an improvement in grade of ore mined, it is unlikely that domestic production can supply the 50,000 tons of manganese ore annually that Spain needs.

In the Huelva district, 18 mines are now producing manganese at rates varying from three to fifty tons daily. Two groups of mines, the Soloviejo and the Guadianamor, are most prominent. The former mines a 16% ore and concentrates it to 40% Mn; the latter mines a 35% ore.

Iron mining in the district, for lack of supplies and equipment, is at present at a standstill.

On examining the district as a whole, one sees that an abundance of minerals is counterbalanced by a lack of facilities to beneficiate them. For example, a plant to produce copper sulphate would be desirable here, inasmuch as Spanish consumption of this chemical exceeds its production. Also the pyrite mines would be greatly helped by building more plants to produce superphosphates.

Norwegian Mine Output Drops During German Occupation

PROFESSOR THOROLF VOGT
Geologisk Institutt
Norges Tekniske Hogskole
Trondheim, Norway

DURING THE OPEN FIGHTING action in Norway from April 9 to June 9, 1940, most mines stopped operations. Some of the mines, such as the Sydvaranger iron mines, were bombed by the Germans, but most of them remained intact.

The following years the Germans prospected deposits not in operation, and put pressure on the leaders and laborers at operating mines to increase production.

The general German administration of Norway comprised three different organizations, which worked more or less independently, and in addition the quisling "government," which was set up by the Germans to insure obedience. The "Reichskommissariat für die besetzten Norwegischen Gebiete" (R.K.) was the instrument for civil affairs, with a German bank clerk, Terboven, as "Reichskommissar" and the top figure of the whole administration, an unscrupulous, ruthless man with low moral principles. In close cooperation with the "Reichskommissariat" and the quisling police department, the German Nazi-police worked with the "Sicherheitsdienst" (S.D.) or Gestapo, an independent and very powerful and active instrument. The third organization for administration was

XUM

Norwegian Ore Production During Occupation (In Metric Tons)

IRON ORE

	Sydvaranger	Rausand and Fosdalen	Titania	Diverse	Total
1938.....	941,000	197,000	61,000	225,000	1,424,000
1939.....	896,000	226,000	59,000	158,000	1,339,000
1940.....	365,000	181,000	44,000	26,000	616,000
1941.....	324,000	161,000	57,000	25,000	567,000
1942.....	9,000	192,000	62,000	22,000	285,000
1943.....	.....	143,000	48,000	28,000	219,000
1944.....	40,000	163,000	43,000	18,000	264,000

COPPER ORE

	Sulitjelma	Roros	Foldal	Vigsnes	Diverse	Total
1938.....	22,200	5,300	2,000	2,200	1,500	33,200
1939.....	21,500	5,200	2,400	1,600	1,500	32,200
1940.....	17,000	3,600	2,300	1,300	1,100	25,300
1941.....	17,400	3,900	3,000	1,400	1,100	26,800
1942.....	15,100	2,500	2,600	1,100	1,000	22,300
1943.....	13,200	3,300	2,100	1,400	1,200	21,200
1944.....	12,900	3,100	2,000	1,100	1,000	20,100

PYRITE ORE

	Lokken	Bjorkasen	Stordo	Sulitjelma	Vigsnes	Killingdal	Foldal	Diverse	Total
1938..	511,000	134,000	127,000	93,000	63,000	47,000	38,000	15,000	1,028,000
1939..	509,000	132,000	130,000	88,000	64,000	43,000	48,000	11,000	1,025,000
1940..	385,000	95,000	99,000	58,000	47,000	26,000	46,000	5,000	761,000
1941..	526,000	95,000	109,000	68,000	47,000	39,000	46,000	3,000	933,000
1942..	469,000	71,000	93,000	71,000	36,000	35,000	43,000	5,000	823,000
1943..	529,000	58,000	52,000	57,000	34,000	36,000	35,000	8,000	809,000
1944..	454,000	56,000	81,000	57,000	27,000	32,000	33,000	10,000	750,000

TITANIUM ORES,

	Ilmenite, Titania	Rutile, Kragero
1938.....	49,000	80
1939.....	55,000	82
1940.....	52,000	87
1941.....	61,000	87
1942.....	61,000	70
1943.....	66,000	105
1944.....	64,000	77

ZINC ORE

	Sulitjelma	Foldal	Vigsnes	Diverse	Total
1938.....	6,200	1,900	2,700	4,300	15,100
1939.....	6,100	2,400	1,800	1,500	11,800
1940.....	1,600	2,400	800	1,000	5,800
1941.....	3,400	2,400	800	900	7,500
1942.....	3,200	2,400	1,700	1,000	8,300
1943.....	3,000	2,400	1,500	1,900	8,800
1944.....	2,900	1,900	900	2,400	8,100

MOLYBDENUM ORE in Metric Tons (100% MoS_2)

	Knaben	Diverse	Total
1938.....	735	35	770
1939.....	647	64	711
1940.....	470	9	479
1941.....	359	23	382
1942.....	577	37	614
1943.....	353	26	379
1944.....	387	26	413

NICKEL ORE

	Evje	Hosanger	Total
1938...	28,600	5,600	34,200
1939...	22,400	6,600	29,000
1940...	19,900	5,100	25,000
1941...	15,800	5,800	21,600
1942...	16,100	5,700	21,800
1943...	14,400	1,300	15,700
1944...	12,100	1,800	13,900

the German army and navy.

In June, 1940, the "Reichskommissariat" organized systematic research on the economic possibilities of mineral deposits in Norway. Terboven stated in one of his first speeches, that the Germans had found more than 40 new, large ore deposits in Norway; later on, however, we heard no more about them; surely they are non-existent.

The program of this part of the German organization was to find out: which mines could increase their production; which mines would soon be exhausted; which vacated deposits could resume operations; which deposits were depleted; which intact deposits should be examined inter alia by experimental mining.

The R. K. cooperated with the German industry, which formed organizations to prospect Norwegian mineral deposits. There existed also a close cooperation between "Gruppe Bodenforschung" of the R. K. in Norway, and of the "Reichsamt für Bodenforschung" in Germany and "Gesellschaft für praktische Lägerstättenforschung" in Germany. In this way the German state also obtained privileges within the Norwegian mineral industry.

Krupp, I. G. Farbenindustrie and Gesellschaft für Elektrometallurgie were especially interested in molybdenum and nickel ores. Mansfeld A. G., Duisburger Kupferhütte and Norddeutsche Raffinerie were interested in copper ore, Schlesag in zinc ore, Sachsenerz in cobalt and bismuth ores, and Vereinigte Stahlwerke and Hermann-Göring-Werke in iron ore. Several of these groups were wholly German and with German leaders. Further, the Germans started or financed two, to outward semblance, Norwegian firms, the leaders of which were willing to act as instruments for German interests. These firms, A/S Malmundersokelser (Holger Fangel) and A/S Preben Giertsen, operated deposits and obtained formal mining rights for the Germans.

Metals of military importance ("kriegswichtig") were, according to the Germans in Norway, the steel alloy metals molybdenum, tungsten, cobalt, niobium and tantalum, also zirconium and lithium; the latter elements were said to be used for the electric storage batteries in the submarines as an air improving remedy. Suddenly caesium rose to a metal of military importance, perhaps because the element is employed in infra-red work.

Nickel was not urgently needed, as the Germans procured nickel from the large deposits at Petsamo in Finland. The requirements of chromium grew at a late stage, after Turkey stopped exporting chromite to Germany. They apparently had sufficient vanadium.

From intact molybdenite deposits they obtained about 30 metric tons 100% MoS_2 during the whole occupation, principally from a deposit near Drammen. The old mines, especially the Knaben mines, were, however, forced to produce a rather large quantity.

The zircon-bearing pegmatites of the Oslo area were examined, but without practical result. Norwegian mineralogists accidentally found a Pre-Cambrian granite pegmatite with lithium minerals at Hoidal, and minerals with a very low percentage of caesium. This small deposit was not of economic interest, however. The largest deposit of caesium minerals (pollucite) so far known is situated at Varutrask in Sweden.

Mica (muscovite) was produced by one of the pseudo-Norwegian companies, with a German mica organization, and with a German as the real leader. The mica deposits, mostly small granite pegmatites, were rather quickly vacated, and a large number of mines, about 80 to 100, were therefore worked simultaneously. The amount of mica produced is unknown to the author.

Some nickel deposits, at Feoy, Erteli, Espedalen and Rana in Ofoten, were examined, but not worked. During the latter part of the occupation, several small chromium deposits, especially near Feragen, were examined, but not worked.

As to copper and sulphur, some vacated pyrite deposits in Hardanger and at Mofjellet were operated. Several other deposits were examined, and a research society ("Studiengesellschaft") was started for the large Grong deposits owned by the Norwegian government.

The Germans could not procure machinery for starting really new mining industries. With a few exceptions, they got very little in return for their extensive prospecting.

Turning now to the ore production, almost exclusively from mines in operation before the occupation, German mining engineers from R. K. fixed a production program for the following year for every mine of consequence. The first program was fixed in the fall of 1940, and later on for each year. The production was controlled at intervals. If the program was not kept, which frequently was the case, this was reported to S. D. This institution also sent their Norwegian secret informers to the mines to expose sabotage. At many mines, also, quislings resided, who reported to the Germans. The conditions for mining gradually grew worse, and in many places the difficulties reached their zenith early in 1945.

In the autumn of 1944, shipping of ore practically stopped, as so many ships had been bombed or torpedoed. At the cessation of the occupation, most of the mines, therefore, had large stores of produced ores.

The production in the years 1938-44 of iron ore, practically all high grade concentrates, is shown in the accompanying table.

Magnetite Plant Bombed

A/S Sydvaranger mines are situated near Kirkenes in eastern Finmark, near the former Finnish, now Russian boundary. This magnetite deposit contains a metamorphic taconite ore of the Lake Superior type, with approximately 32% iron. The magnetite concentrates contain about 66% Fe, 0.01% P and 0.01% S. The plant was first bombed by the Germans, and the production was later kept down through sabotage and Russian bombing. The small quantities produced in 1942-44 represented lump ore. In October 1944 Kirkenes was delivered by the Soviet army. The Germans burned practically all houses and works before they left, and about 3,000 persons had to seek refuge in the mines and live there for some time. New plants are under construction for the same capacity as before the war, and with American machinery. Production of ore concentrates may start in 1949 at the earliest.

The Fosdalen mine at the Trondheim fjord produces a magnetite concentrate with about 66% Fe, 0.02% P and 0.8% S. In the fall of 1942 some special sabotage actions took place. The ores of the Rausand mine at Möre and the Titania mine near Ekersund belong to the gabbro type with magnetite and ilmenite, and with some vanadium in the magnetite. The magnetite concentrates contain about 62 to 66% Fe, 2 to 3% TiO_2, and 0.5% V. All vanadiferous ore produced in Norway was kept in the country during the occupation and melted at Christiania Spikerverk, Oslo, and at Svelgen, Bremanger.

The production of ilmenite concentrates, with about 44% TiO_2, at Titania appears in the accompanying table. Here also production of rutile from minor mines near Kragero is included, calculated as 100% TiO_2.

The pyrite deposits of Norway represents different ore types, and consequently different products. The figures of the pyrite production in the accompanying table represent, therefore, rather heterogeneous values.

The pyrite from Stordo is an extremely fine-grained non-cupriferous ore of sedimentary origin, with about 39-42% S and 0.1% Cu. The other deposits mentioned are epigenetic, but with different sizes of grains, according to formation or recrystallization at different temperatures. The ore at Lokken (Orkla Grube A/S) and to a less extent at Killingdal are fine-grained, the former with about 41-42% S and 2% Cu, and the latter with about 45% S and 2% Cu. They are not floated. Sulitjelma, Björkasen, Vigsnes, Foldal, Röros and Mofjell have a more or less coarse-grained ore, and plants for selective flotation. The pyrite concentrates contain about 48 to 50% S and 0.2% Cu, the zinc concentrates about 43 to 48% Zn, and the copper concentrate about 17 to 25% Cu.

Sabotage Curtails Output

Leaders of the mines generally mined the least valuable ores in the mines. At Lokken, for instance, the copper content in the ore dropped from about 2.1 to 2.3% in 1938-39, to 1.8 to 2.0% in 1941-44, whereas the sulphur content remained nearly constant. The general decline of the production had many causes: special sabotage actions by Norwegian commandos, or parachute men (e. g., Lokken); a reduced laboring tempo partly on account of sabotage, partly also for natural reasons; want of food, clothing and shoes, men leaving their work in the mines to settle as small farmers or getting other work, or, in the border areas, escaping to Sweden. At Sulitjelma, for instance, in 1944 alone, about 200 men escaped to Sweden with their wives and children and relatives. Summer and winter they fled over long pathless distances across the mountains before they arrived at the first station on the other side of the border. It was a large area, where every person met was to be shot, but that didn't prevent the current of refugees. The transport of the refugees was organized, and helped by the leaders of the mines. At Sulitjelma the Germans had an "Á-list" of persons who were first to be liquidated.

The metal of the greatest military importance, which Germany obtained from Norway probably was molybdenum. The production of molybdenite ore principally originated from the Knaben mine in southernmost Norway; only small quantities were produced at Oterstrand in Nordland, Sörumsasen near Drammen and Bandaksli in Telemark. See accompanying table.

Mine Laborers Escape

As the production at Knaben declined, the director Sverre Blekum was dismissed and later died. A German leader and several German employees were then installed. In the fall of 1941, as the laborers escaped from the mine, new miners were drafted to do the mining, according to a new decree. The plant was bombed by Allied forces, particularly heavily in November, 1943. The ore dressing plant was destroyed, and a new plant constructed down in the mine at the second level. In 1944, 240 Russian prisoners ("Ostarbeiter") were sent to the mine as laborers, and also a German "Bergbaukompanie." In 1945, 138 Germans and 250 Russian prisoners worked in the mine.

Only an insignificant amount of tungsten ore is mined in Norway. The production declined from 19 tons of ore, calculated as 100% WO_3, in 1939 to 4 tons in 1942, when the mining was discontinued.

The production of nickel ore appears in the accompanying table.

The ore from Evje near Kristiansand contains about 3.5% Ni and 2.5% Cu, and from Hosanger near Bergen about 6% Ni and 2.5% Cu. Both mines are nearly exhausted.

Mining and other industries in Norway have recovered satisfactorily after the occupation, being favored by exceptionally stable and quiet political conditions.

THIS WAS A LEAD REFINERY of the Italian Pertusola company at La Spezia. Allied attacks put it out of business.

Starting Over in Sardinia

MICHAEL MARSH
Paris Bureau
McGraw-Hill World News

ITALIAN PRODUCTION of lead and zinc increased considerably in 1946, owing largely to resumption of output from the mines on the island of Sardinia. Normally producing 90% of Italy's lead and zinc, the Sardinian mines had been shut down since late 1942 because of lack of power to operate pumps. They began reopening in November 1945, and output has increased steadily.

Monthly Output of Sardinian Mines in Metric Tons of Concentrates

	Lead	Zinc
Soc. Mineraria Metallurgica di Pertusola	500	1,500
Soc. Piombo e Zinco Montevecchia	800	900
Soc. Monte Poni	400	800
Azienda Minerali Metalli Italiana	200	400

According to C. A. Abetti, Procurator-General of the Soc. Min. e Met. di Pertusola, recovery has been hampered by labor shortages, especially of skilled workers. Nevertheless, Pertusola hopes to get its output up during the second half of the year to 1,200 tons monthly of galena and 2,000 tons monthly of zinc concentrates.

The labor shortage causes all Sardinian firms to press for maximum use of machines. Pertusola, for example, has ordered $25,000 worth of mechanical loaders, jumbos, and new drifter drills. The staff is testing detachable bits, and will also experiment with the sink-and-float process in the mill at San Gavino. The Pertusola lead refinery suffered badly during the war, but the zinc refinery at Crotone in Cambria, Italy, built by Americans before the war under Anaconda patents, came through undamaged.

Sardinian mines are all underground except for the Buggeru mine, which is half open-pit, and all suffer from severe water flows. Because of a general lack of enough power to pump adequately, the companies have jointly asked the Italian Government for funds to build a new power plant capable of supplying 20,000,000 kwh. annually.

MARKETS — Trends and Prices

Fourth-Quarter Outlook for Copper, Lead, and Zinc Improves—Silver Higher—Refined Platinum Lower

BUYING OF MAJOR NON-FERROUS metals at an improved rate featured operations during September, indicating that consumers have become convinced that business conditions over the last quarter of the year will sustain a fairly high level of production. Demand for copper, lead, and zinc was such that producers now feel certain that deliveries throughout the Oct.-Dec. quarter will be larger in volume than in the preceding quarter.

Wide interest was shown in an invitation issued by the Bureau of Federal Supply, Treasury Department, for offers of copper, lead, zinc, cadmium, and bismuth for the Government's permanent stockpile. Before offering the metals to the Bureau, prospective sellers were asked to furnish proof that the materials had been offered to at least three consumers and turned down. Another stipulation on the sales contract called for a reduction in the price for any undelivered tonnages in the event that the market sold off. Members of the trade objected to the pricing clause, but were given to understand that the terms would, if necessary, be revised to conform with regular business practices. All matters relating to the purchase of metals for the stockpile were to be held in strictest confidence. Whether the Government intends to come into the market for appreciable tonnages could not be determined.

Consumers were somewhat bewildered over the stockpiling developments, for it was argued that buying of metals at this time for the strategic reserve would tend to support the price structure. For a time, the threat of larger offerings in this market of copper, lead, and zinc from foreign sources, growing out of the need for dollar credits, caused sentiment to shift a little to the bear side. A new outlet for metals, such as stockpile buying, would make it exceedingly difficult to pass judgment on the forces that normally regulate supply and demand in a free market.

The recent action of the silver market offers an excellent illustration of how the experts can be stumped when a government suddenly steps in and takes a strong hand in the proceedings. Until Mexico decided to absorb, out of current production, about 2,000,000 oz. of silver a month for three consecutive months, silver merchants viewed the outlook for the price structure to be unfavorable, and, no doubt, they acted accordingly. The withdrawals of silver by Mexico for coinage proved large enough to tighten up the market and reverse the price trend. Silver advanced further during September, closing about 10c. an ounce higher than the price that obtained before the support came into the market. Uncertainty over the future of Mexico's program makes it impossible to form an opinion on the probable course of the market for foreign silver.

Copper producers were concerned over the trend in consumption. Whether the revival in business that is expected to take place in the last quarter will be sufficient in volume to remove all doubt in regard to the stability of the price structure was the vital point debated in market circles.

The record for the January-August period, covering deliveries to consumers and estimated consumption by fabricators, in tons, follows:

	Deliveries	Consumption
January	143,692	139,263
February	117,734	118,633
March	120,820	115,211
April	115,379	116,681
May	118,048	113,157
June	116,652	104,130
July	109,817	87,167
August	96,304	96,484

Production of refined copper in the United States from material of domestic and foreign origin amounted to 88,052 tons in August, against 94,605 tons in July. Unless domestic consumption rises to well above 100,000 tons a month, the tonnages of foreign refined that will be needed to round out our requirements will not be large. The dollar shortage slowed foreign buying throughout September to a rather disturbing degree. Fortunately, foreign producers had a good backlog of business on their books with which to weather a quiet spell. Quotations in the foreign market showed no important change. There was talk of a lower market in forward copper. Business closed at concessions was limited in volume because of the exchange situation.

Domestic consumption of refined lead probably dropped to less than 60,000 tons a month over the third-quarter period. Consumers experienced no difficulty in obtaining necessary supplies. Offerings of foreign lead increased, and, at one time the market was quotable at 14c. to 14¼c., f.a.s. Gulf ports. The domestic market for lead continued steady to firm at 15c., New York. In the event that the Government purchases "weak" foreign lead for the stockpile the market would certainly remain firm over the remainder of the year, operators thought.

Zinc moved along in a quiet way at unchanged prices. Prime Western held at 10½c., East St. Louis, with foreign metal available at 9¾c., f.a.s. Gulf ports. The Tri-State zinc concentrate market, which was upset by the expiration of the Premium Price Plan, witnessed an upward adjustment in the settlement basis. On open market transactions, the price was raised to $70.35 per ton. Sales of concentrate to the Central Mill of Eagle-Picher were closed on the basis of $72. The previous open-market quotation was $64 per ton.

Except for the fact that tin production is now increasing at a good rate in the Far East, the outlook for the metal would still be rather gloomy. Production of tin in concentrates in Bolivia in the first seven months of 1947 amounted to 18,194 metric tons, against 21,542 tons in the same period

U.S. Slab Zinc Statistics

(American Zinc Institute)

Production of slab zinc of all grades as reported by producers represented in the membership of the Institute is shown in the following table. Production from foreign ores has been included, beginning with 1940. Figures in tons.

		Shipments				Stock
	Production	Domestic	Export	Gov't Acc't	Total	at End
1939	538,198	598,972	.....	.....	598,972	65,995
1940	706,100	674,615	88,165	.....	762,780	17,582
1941	863,955	751,276	106,195	.....	857,471	24,066
1942	929,770	733,918	151,650	.....	885,568	68,268
1943	971,873	831,430	56,208	.....	887,638	173,510
1944	901,332	830,334	6,988	.....	837,322	237,520
1945	799,520	762,925	9,422	5,302	777,649	259,391
1946	759,346	714,292	66,638	62,007	842,937	175,800
1947:						
Jan.	72,332	67,211	7,584	.....	74,795	173,337
Feb.	65,198	65,356	10,718	.....	76,074	162,461
March	75,376	67,325	8,463	.....	75,788	162,049
April	73,891	61,715	10,528	.....	72,243	163,697
May	73,970	58,827	11,976	.....	70,803	166,864
June	70,990	52,390	11,137	.....	63,527	174,327
July	69,128	44,801	14,936	.....	59,737	183,718
August	66,852	52,132	5,487	2,034	59,653	190,917

last year. There were no price developments in tin during September.

Platinum was under pressure as the market got over a spell of uncertainty that threatened to revive outside participation in the commodity. Second-quarter statistics issued by the Bureau of Mines disclosed that Russia shipped 23,460 oz. of refined platinum, and 35,050 oz. of palladium to the United States. The price of refined platinum was reduced to $59 an oz. on Sept. 29, a decline of $7 from the high for the month.

Quicksilver was unsettled on indications that foreign producers have not been able to get together on future sales policy. Consumers look for a more aggressive selling movement. As the month ended it was possible to buy foreign metal for shipment at around $80 per flask, duty paid, New York. The spot quotation declined to $81. The news that a shipment of quicksilver from Yugoslavia is now afloat consigned to this country added to the confusion. Domestic production of quicksilver in the second quarter amounted to 5,700 flasks. Imports in the same period totaled 1,084 flasks. The Government sold 1,200 flasks of metal brought here early this year from Japan.

Tungsten ore was easier. Consumer resistance brought the price down to around $30 a unit of WO_3, duty paid, New York.

Fluorspar was advanced $1.50 per ton, owing to higher costs.

Asbestos has been in excellent demand, though prices being paid are substantially higher than those in force at the end of the war. Output of asbestos in the Province of Quebec in July amounted to 53,434 tons.

RFC Stocks of Metals

Stocks of non-ferrous metals in the hands of the Office of Metals Reserve, RFC, on June 30 and July 31, in tons, were as follows:

	June 30	July 31
Copper, refined	13,850	10,874
Lead, refined	8,576	4,830
Zinc:		
Grade A	136,517	138,954
Grade B	21,135	22,858
Totals	157,652	161,812
In ore, etc.	(a)	211,821
Total	....	373,633
Tin (b):		
Refined	16,774	14,820
In ore, etc.	17,150	16,709
Totals	33,924	31,529
Antimony:		
Metal	6,583	7,588
In ore	244	244
Totals	6,827	7,832

(a) Gross weight of stocks 471,486 tons. (b) Long tons.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Sept. 1947	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: East St. Louis
1	Holiday	21.425	Holiday	Holiday	Holiday	Holiday
2	21.225	21.425	80.000	15.000	14.800	10.500
3	21.225	21.400	80.000	15.000	14.800	10.500
4	21.225	21.350	80.000	15.000	14.800	10.500
5	21.225	21.300	80.000	15.000	14.800	10.500
6	No Market	21.300	80.000	15.000	14.800	10.500
8	21.225	21.425	80.000	15.000	14.800	10.500
9	21.225	21.350	80.000	15.000	14.800	10.500
10	21.225	21.350	80.000	15.000	14.800	10.500
11	21.225	21.425	80.000	15.000	14.800	10.500
12	21.225	21.425	80.000	15.000	14.800	10.500
13	No Market	21.425	80.000	15.000	14.800	10.500
15	21.225	21.425	80.000	15.000	14.800	10.500
16	21.225	21.325	80.000	15.000	14.800	10.500
17	21.225	21.325	80.000	15.000	14.800	10.500
18	21.225	21.400	80.000	15.000	14.800	10.500
19	21.225	21.400	80.000	15.000	14.800	10.500
20	No Market	21.425	80.000	15.000	14.800	10.500
22	21.225	21.350	80.000	15.000	14.800	10.500
23	21.225	21.400	80.000	15.000	14.800	10.500
24	21.225	21.425	80.000	15.000	14.800	10.500
25	21.225	21.425	80.000	15.000	14.800	10.500
26	21.225	21.375	80.000	15.000	14.800	10.500
27	No Market	21.425	80.000	15.000	14.800	10.500
29	21.225	21.425	80.000	15.000	14.800	10.500
30	21.225	21.375	80.000	15.000	14.800	10.500
	AVERAGES FOR MONTH					
Sept.	21.225	21.388	80.000	15.000	14.800	10.500
	AVERAGES FOR WEEK					
Sept.						
3	21.225	21.320	80.000	15.000	14.800	10.500
10	21.225	21.346	80.000	15.000	14.800	10.500
17	21.225	21.392	80.000	15.000	14.800	10.500
24	21.225	21.400	80.000	15.000	14.800	10.500
	CALENDAR WEEK AVERAGES					
Sept.						
6	21.225	21.367	80.000	15.000	14.800	10.500
13	21.225	21.400	80.000	15.000	14.800	10.500
20	21.225	21.383	80.000	15.000	14.800	10.500
27	21.225	21.400	80.000	15.000	14.800	10.500

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Sept. 1947	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold (d) London	Gold (d) United States
1	Holiday	Holiday	42.000d.	172s. 3d.	Holiday
2	402.500	68.750	42.000d.	172s. 3d.	$35.00
3	402.500	69.750	41.750d.	172s. 3d.	35.00
4	403.000	70.250	42.125d.	172s. 3d.	35.00
5	403.000	70.250	42.625d.	172s. 3d.	35.00
6	(e)	(e)	(e)	(e)	35.00
8	403.000	70.250	42.625d.	172s. 3d.	35.00
9	402.750	70.250	42.625d.	172s. 3d.	35.00
10	402.500	70.250	42.625d.	172s. 3d.	35.00
11	402.500	70.500	42.750d.	172s. 3d.	35.00
12	402.750	70.500	42.750d.	172s. 3d.	35.00
13	(e)	(e)	(e)	(e)	35.00
15	402.500	70.500	42.750d.	172s. 3d.	35.00
16	402.500	70.500	42.750d.	172s. 3d.	35.00
17	402.500	70.500	42.750d.	172s. 3d.	35.00
18	402.500	70.500	42.750d.	172s. 3d.	35.00
19	402.500	70.750	42.875d.	172s. 3d.	35.00
20	(e)	(e)	(e)	(e)	35.00
22	402.500	70.875	42.875d.	172s. 3d.	35.00
23	402.500	71.375	43.375d.	172s. 3d.	35.00
24	402.750	71.375	43.375d.	172s. 3d.	35.00
25	402.750	71.375	43.250d.	172s. 3d.	35.00
26	402.750	71.375	43.250d.	172s. 3d.	35.00
27	(e)	(e)	(e)	(e)	35.00
29	402.500	71.375	43.250d.	172s. 3d.	35.00
30	402.500	71.375	43.250d.	172s. 3d.	35.00
		AVERAGES FOR MONTH			
Sept.	402.631	70.601	42.744	—	35.00
		AVERAGES FOR WEEK			
Sept.					
3	402.563	69.375	—	—	—
10	402.850	70.250	—	—	—
17	402.550	70.500	—	—	—
24	402.550	70.975	—	—	—

Calendar week averages; New York Silver: Sept. 6th, 69.750; 13th, 70.350; 20th, 70.550; 27th, 71.275.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.275c. per pound, the average differential for freight and delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade in most instances is 1¼c.

Quotations for lead are for common lead.

(c) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions, and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKET—Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for August and September:

	Aug.	Sept.
Quicksilver, N. Y. flask....	84.000	81.640
Antimony (a)	35.940	35.940
Antimony, bulk, Laredo...	33.000	33.000
Antimony, in cases, Laredo	33.500	33.500
Antimony, Chinese (b)....	.....	.....
Platinum, oz. troy	55.615	63.640
Cadmium (c)	175.000	175.000
Cadmium (d)	177.500	177.500
Cadmium (e)	180.000	180.000
Aluminum ingot	15.000	15.000
Magnesium	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

100 is composite for 1922-3-4. (Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1937.....90.86		1942.....86.80	
1938.....73.67		1943.....88.74	
1939.....77.71		1944.....88.74	
1940.....79.22		1945.....90.86	
1941.....83.49		1946.....110.057	
	1945	1946	1947
January	88.74	96.42	140.88
February	88.74	96.42	140.42
March	88.74	96.42	150.71
April	88.74	96.42	153.14
May	88.74	96.42	154.03
June	88.74	107.16	150.05
July	88.74	117.11	148.73
August	88.74	113.32	149.35
September	91.16	113.32	150.80
October	96.40	114.25	.....
November	96.42	131.23	.....
December	96.42	142.19	.....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major non-ferrous metals. Prevailing delivered prices for consumers in the United Kingdom follow:

	Per Long Ton		
COPPER:	£	s.	d.
Electrolytic, high conductivity....	132	0	0
Fire refined, high conductivity....	132	0	0
Fire refined, high grade.....	131	10	0
Fire refined, min. 99.2 percent....	131	0	0
Fire refined, min. 99.7.....	130	10	0
Hot rolled black wire rods.....	138	0	0
LEAD:			
Soft, foreign, duty paid.....	90	0	0
Soft, Empire	90	0	0
English refined	91	10	0
ZINC:			
Foreign (G.o.b.), duty paid.....	70	0	0
Domestic (G.o.b.)	70	0	0
Prime Western and debased.....	70	0	0
Refined and electrolytic.....	70	15	0
Minimum 99.99 percent.....	72	5	0
TIN:			
Ingot, 99 percent.....437		0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

MISCELLANEOUS METALS

(September 30, 1947)

Aluminum, ingot, 99 plus percent, lb.	15c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	$5.940
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$1.75
Calcium, lb. ton lots, 98 percent, cast.....	$1.85
Chromium, 97 percent grade, lb.....	89c.
Cobalt, 97 to 99 percent, per lb.....	$1.65
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb.....	35c.
Magnesium, 99.8 percent, carloads, lb.....	20½c.
Palladium, troy oz.....	$24.00
Platinum (Official quotation wholesale lots) troy oz.....	$59.00
Quicksilver, flask of 76 lb., 25 flasks or more.....	$81.00
Selenium, 99.5 percent, lb.....	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.....	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.....	$20.00
Titanium, 96 to 98 percent, lb.....	$8.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit.....	$14.00@$16.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 48% Cr_2O_3, 2.8 to 1 ratio (Prices nominal).....	$37.00@$38.00
48% Cr_2O_3, 3 to 1 ratio.....	$39.00@$40.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$5.95
Mesabi bessemer	$5.70
Old Range non-bessemer	$5.80
Mesabi, non-bessemer	$5.55
Lead (Galena) 80 percent, Joplin, Mo., ton.....	$195.65
Manganese Ore—Per long ton unit of Mn, basis 48 percent manganese, subject to premiums and penalties, f.o.b. cars Atlantic and Gulf ports, duty paid, 63@66c.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines.....	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent, duty paid.....	$29.50@$30
Domestic, scheelite, 60 percent and upward.....	$30
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines.....	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$70.35

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots	6c.
Cobalt Oxide, 70 to 71 percent, lb.....	$1.27½
Copper Sulphate, 100 lb.	$7.60

ALLOYS

Beryllium Copper, 2.5 to 3 percent Be, per lb. of contained Be	$14.75
Ferrochrome, 65 to 70 percent, per lb. of Cr contained....	15.60c.
Ferromanganese, 78 to 82 percent, gross ton.....	$150.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si.....	7.80c.
Ferrotungsten, 75 to 80 percent, lb. of W contained.....	$2.50
Ferrovanadium, per lb. of V delivered.....	$2.90
Silicomanganese, 1½ percent C, per lb., contracts.....	7.40c.

NON-METALLIC MINERALS

Asbestor, f.o.b. Canada (Quebec) mines (U.S funds), ton:	
Crude No. 1	$800
Crude No. 2	$302@$410
Spinning fibers	$170@$230
Paper stock	$43@$65
Shorts	$20@$38
Vermont, f.o.b. Hyde Park:	
Shingle stock	$83.50@$91.50
Paper stock	$58.00@$65.00
Waste	$43.00
Refuse or shorts.....	$20.50@$38.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton.....	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton.....	$9.00@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried).....	$4.00@$5.00
Domestic, chemical, 55 to 58 percent.....	$7.50@$8.50
Domestic, abrasive, 80 to 84 percent.....	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, airfloated, bulk....	$6.75@$8.00
Maryland, ball, bulk	$7.00@$9.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh.....	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 70 percent, all rail movement, ton.....	$34.50
Acid 98 and 1 percent, bulk, ton.....	$38.50
Fuller's earth, f.o.b. Georgia or Florida, ton.....	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington.....	$24.00
Mica—Domestic f.o.b. mines. Punch, 6 to 15c. per lb. according to size and quality. Sheet, clear, 1½x2 inch, 60 to 65c.; 2x2 inch, 95c. to $1; 2x3 inch, $1.35; 3x3 inch, $1.80; 3x4 inch, $2.25; 3x5 inch $3; 4x6 inch, $4; 6x8 inch, $6. Wet ground, very fine, $90 per ton. Bulk sales, dry ground, $32.50 per ton. Scrap, 28 and up, depending on quality.	
Ocher, Georgia, ton, in sacks.....	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	14c., nom.
Silica, in bags, 325 mesh, ton.....	$20.00@$40.00
Sulphur, Texas, mines, long ton.....	$16.00@$18.00
Talc, f.o.b. works, ton:	
New York, air-floated, 325 mesh.....	$18.50@$20.00
Vermont, extra white, 200 mesh.....	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored.....	$14.50

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic.....	$36.00
Steel, base price, Pittsburgh Billets, gross ton.....	$45.75
Structural shapes, 100 lb.....	$2.80

WASHINGTON REFLECTIONS

McGraw-Hill Washington News Bureau

Election Indicates Taft-Hartley Law Is Popular

The Taft-Hartley law in use as a political plank for the first time, weathered a Democrat-labor assault in a Pennsylvania by-election last month.

Philip H. Storch, Democrat and labor leader, had promised Pennsylvania's 8th District voters he would work for repeal of the new labor law. He was supported by the C.I.O., A.F.L., independent unions, and the railroad brotherhoods. He lost the fight for the Democrats by a greater margin than in the 1944 election.

The Republican contender, F. H. Lichtenwalter, speaker of the Pennsylvania legislature's House, had asked only that the law should be given a fair trial.

Political observers reported that the Democrats themselves saw the reaction to the attack on the law and made an attempt to soften their criticism at the last minute, to no avail.

The labor-Democratic coalition had one surprising setback. It lost by 603 votes in industrial Allentown. This was partly due to a split within Democratic ranks caused by the union-dominated Storch contingent setting up its own headquarters. This didn't sit too well with some old-line Democrats and lent credibility to Republican charges that the campaign was in the hands of "C.I.O. carpetbaggers."

Labor leaders are now consoling themselves with the thought that the test came too early, that rank and file members haven't felt much pinch from the law yet. That labor politicians will drop their all-out attack on the law is out of the question.

Freight Rate Increase Asked Because of High Wages

American railroads have asked the Interstate Commerce Commission for a third round of freight rate increases and there is the possibility of a fourth round coming up before the end of the year. (See News of Industry)

Under the amended tariffs filed with the ICC, line-haul carload freight rates on commodities vital to the mining, milling and smelting industry would be increased as prescribed for each territory, but with certain maximums for certain commodities.

The commodities and the maximum increases are as follows: Sand (foundry, glass, moulding, etc.), 60¢ per net ton, but not less than 30¢ per ton. Slate, coal, coke, clay or shale cinders; limestone, marl, pumice, quartzite rock, ganister rock, silica rock, crude dolomite (not roasted), perlite rock, expanded slag, marble or granite stone, iron ore tailings, volcanic scoria, furnace slag (other than open hearth basic), and fluxing stone, 30¢ per ton, net or gross as rated. Roasted dolomite, 75¢ per ton, net or gross as rated. Salt, three cents per 100 lb. Cement, lime, plaster, nine cents per 100 lb. Granite curbing and paving blocks, 45¢ per net ton. Wooden box, crate and cooperage materials, woodwork and millwork, lumber, posts, poles, piling, ties (mine or railroad), veneer and built up wood, 18¢ per 100 lb. Sulphur 1½¢ per 100 lb. Iron and steel commodity rates generally, including rails, axles, pig iron, tin or terne plate and scrap, and wire, would be increased a maximum of 10¢ per 100 lb. but not in excess of two dollars per ton, net or gross as rated.

In connection with the immediate 10% increases, the roads propose limiting coal and coke rates to an increase of 10¢ a net ton or 11¢ a gross ton, and limiting iron ore to an increase of 10¢ a ton.

Metal Subsidy Issue Marks Time in Political Circles

The scarcity of Congressional investigations into problems of the mining and allied industries during the summer, in the face of the many gloomy pronouncements on the effects of the Presidential veto of the Allen (Premium Price Plan) bill, has many people in and out of Washington puzzled.

The answer appears to lie in political timing. In Washington it is the consensus that it is too early to start "bandwagon" hearings into the plight of the industry.

Outside of a few tentative statements on cures of the industry's ills, made by individual politicians on "fence mending" expeditions, there have been no policy declarations by mining-state Congressmen. However, the House Small Business Committee has been holding hearings in the West during September and October and has taken testimony on the effect of loss of premiums.

In the meantime, many hard-hit marginal producers are expected to carry on as best they can pending the outcome of the coming Congressional fight to continue the metals subsidy. That there will be a fight is an accepted fact. Whether the strategy on continuing the subsidy will take the form of another bill continuing the Premium Price Plan, a stockpiling subsidy, or something else, is not yet known.

MMSW Officials Will Not Take Non-Communist Oath

All the to-do about whether officials of the C.I.O. must, or will, file non-Communist affidavits with the National Labor Relations Board has little, if any, bearing on the situation in the metal mining industry.

International officials of the Mine, Mill and Smelter Workers Union, C.I.O. affiliate, will not file such sworn statements which are necessary if this union wants to avail itself of the NLRB machinery. That settles the question. Whether officials of the parent C.I.O. file affidavits is academic.

Feiss Joins Bureau of Mines As Assistant to Director

Julian W. Feiss, editor of the Mining Congress Journal for the past year, has been appointed to a newly established post, assistant to the director of the Bureau of Mines. In this position he will correlate long-range mineral policies for the Bureau. He will assume the position December 1.

Mr. Feiss, a native of Cleveland, Ohio, is a graduate of Princeton University, where he received an AB degree in geology. He received his master's degree at the School of Mines, University of Arizona.

Following completion of his education he served from 1929 to 1931 as field engineer of Rhodesian Congo Border Concessions, Ltd. in the Belgian Congo. From 1931 to 1936 he was a member of the consulting firm of Crowell and Murry of Cleveland. From 1937 to 1942 he was associated with Climax Molybdenum Co. In 1942 he joined the U.S. Army, serving until 1946 in military intelligence.

British Offer May Break Tariff Deadlock

The United Kingdom has made the first attempt to break a British-American deadlock on tariff negotiations at the International Trade Organization Conference at Geneva. Britain's concessions will cost American negotiators more than anticipated in the way of U. S. tariff reductions, Washington observers believe.

The new British offer, it was understood, would call for tariff reductions by the U. S. up to 25% ad valorem on about 100 commodities, to balance the elimination of certain Imperial preferences. Just what the reduction and commodities would be was not spelled out, but the offer is far short of what

the Americans have hoped to obtain.

Officials returning from Geneva have admitted that developments during the last few months have reduced the possibility of "immediate accomplishments" by the projected International Trade Organization. Several of the officials have stated that the U. S. has obtained about half the concessions it wanted and has made some progress on elimination of Empire preferences.

Some of the preferences would be reduced immediately, some gradually. Until the recent "break," however, Britain has stood adamantly for retention of preferences, despite its commitments under the loan agreement, because the British could not see any way of balancing their losses through tariff concessions offered by us. The recent offers may push the negotiations to a conclusion, which will then be polished off at a final conference in Cuba in November.

RFC Still Buys and Sells Minerals; Makes Loans

The Reconstruction Finance Corp. is still in the business of buying and selling metal and mineral raw materials, according to a new-style report by the agency on sources and uses of funds.

Rough compilation of figures in the agency's recent report to President Truman on May financial activities discloses that almost $26,000,000 worth of metals and alloys, ores and concentrates, crude minerals, and nonmetallic basic products were sold during the month. Buying of similar items during the month amounted to about $17,637,000.

The explanation is that some of RFC's contractual obligations, entered into during the war, or immediately postwar, to keep industrial activity at a high level, are still in effect and the materials contracted for are still coming in to Government warehouses. Most of the materials bought and sold were foreign in origin, although the percentage could not be determined.

A breakdown of the May disposition of commodities under the heading "iron, steel, nonferrous metals and alloys" shows that refined copper led the list with sales amounting to about $11,000,000. Other sales were: Tin, $7,000,000; aluminum, $2,750,000; nickel, $1,700,000; zinc, $1,100,000; lead, $300,000; and a "various" figure of $700,000.

Sales of metallic ores and concentrates, totalling about $979,100, included the following: cryolite ore, $644,000; chrome, $200,000; zinc, $59,000; lead, $57,500; manganese, $11,000, and beryllium, $7,600.

Sales of crude non-metallic minerals, totalling about $106,000, included $92,000 worth of asbestos, $12,000 worth of corundum and $2,000 worth of talc. Non-metallic basic products sales, totalling about $296,800, include $179,500 worth of mica and $117,300 of graphite.

On the acquisition side of the picture, expeditures for metallic ores and concentrates amounted to about $13,152,400. Heading this list was tin (one of the few commodities remaining under Government control), with an expenditure of $6,844,000. Other acquisitions were as follows: Zinc, $5,198,000; manganese, $507,800; chrome, $234,000; copper, $167,600; tungsten, $121,000 and "various," $52,000.

Purchase of crude non-metallic minerals totalling about $22,500, included $12,000 worth of quartz crystals; $4,500 of talc; $3,000 of asbestos; $2,500 of celestite, and $500 worth of arsenic.

Acquisitions of iron and steel, nonferrous metals and alloys, totalling $4,292,900, included purchase of $3,213,000 worth of copper, $615,000 worth of aluminum, and $464,400 worth of lead.

Purchase of non-metallic mineral basic products, amounting to $164,800, included fluorspar, $135,000, mica, $26,300, and graphite, $3,500.

The report also noted that during May direct metals subsidies amounted to $4,699,615.93. Loans to borrowers engaged in the mining, milling or smelting of ores totalled $8,000,000 during the month.

None of the purchases listed in the report were for the military stockpile, although some may be transferred later. The Treasury Department procures stockpile materials.

Stockpile Objectives Are Not Being Fulfilled on Time

Military stockpilers are worried over industrial opposition to the contractual policy currently in effect for Government stockpile purchases and are on the verge of offering more inducement to sellers in order to obtain this year's budget of strategic materials.

Industry has objected strenuously to the contract stipulation that, in the event of a drop in market prices between the time of sale and delivery, any tonnage undelivered to the Government should be repriced at the lower level. This problem is regarded by industry as in the "heads I win, tails you lose" category. In addition, the stipulation making sellers certify that the metal offered has been offered first to three consumers who refused to buy has resulted in offerings of only minor tonnages of several metals. With respect to copper, the industry is also objecting to the Army-Navy Munitions Board's decision to buy only cathodes. The Board has not changed its policy in this respect, however.

Reports have already filtered through the secrecy surrounding stockpiling procedures that the Board has purchased manganese at higher-than-market prices in order to get the material. Although no official will discuss the situation, it is evident that the stockpilers are considering dropping their non-competitive policy in order to bring the stockpile up to "Objective A" a certain percentage of the long-range goal. They are caught between the Government's desire to avoid competing with consumer industries at high prices and the circumstance that many stockpiles, including copper and lead, are depleted, despite an ominous international situation. Their situation hardly conforms to the military policy of taking precautions against all reasonably possible predicaments in which the nation might find itself. If war should start within the next few years, the armed forces would be "on the spot" for many strategic and critical materials, just as they have been in two world wars.

Indicative of the changing attitude of the Government is the dropping of the "substantially below the current market" clause contained in previous bid invitations.

Antimony Controls Relaxed By Dept. of Commerce

Governmental controls over shipment and export of antimony have been relaxed by the Office of Materials Distribution, Department of Commerce.

Conservation Order M-112, although still in effect, has been modified so as to no longer require application to OMD for permission to ship antimony, including export. Recent administration of the order has been directed towards correlating requests with the form of metal most appropriate in terms of supply and suitability, OMD said.

Authorizations to accept deliveries of the metal will be checked against reports of shipments by producers, distributors and importers. In the case of shipments to Canada, a single control is maintained, consisting of a certification from the Canadian purchaser that he has received OMD authorization to accept the antimony.

The Office of International Trade will issue export licenses against an overall export quota, but the exporter need no longer apply to OMD for authority to ship as he must have authorization to receive the material.

Another change in the order relieves an applicant from naming his supplier. Upon receipt of his authorization he is now free to buy the metal from any source he chooses.

OMD will not arrange for deliveries from RFC stocks unless satisfied that antimony cannot be obtained otherwise.

The Commerce Department stated that current antimony supplies are sufficient for domestic requirements, but that overall shortages are expected to develop again in the near future. Although RFC has the authority to purchase antimony abroad, it has not done so in recent months. However, Government buying of the metal will be resumed, in contracts with China, later in the fall.

XUM

NEWS OF THE INDUSTRY

Left-Wingers Gain Partial Victory in Mine-Mill Union Convention Wrangle—Travis Steps Down

JOSEPH GAMBATESE
McGraw-Hill Washington Bureau

The secession of right-wing anti-Robinson-Travis locals and membership from the Mine, Mill and Smelter Workers Union has ended. Left-wingers retain control of this CIO union of 108,625 members. Now the feuding seems confined to the leftists as to whether they should take over the union lock, stock, and barrel or share control with a right-wing minority.

This conclusion is reached following MMSW's 43rd international convention at St. Paul. The Driscoll-led secessionists were absent and were condemned by the conclave.

In a move to forestall intervention by the CIO convention in the union's left-right split, Maurice E. Travis stepped down from the presidency and with Reid Robinson, former president, tried to put over unanimous acceptance of a compromise slate of new officers headed by John Clark of Great Falls, Mont., a middle-of-the-roader who gets along with communism.

Because opposition to the slate was raised in a last-minute upset of strategy, a referendum election was scheduled for October 6. Travis's withdrawal from the presidency and the referendum conform in part at least to the recommendations of the special CIO committee, which will be considered by the CIO convention in Boston October 13.

MMSW's 350 delegates adhered to the Communist Party line when, following an address by Robinson, they adopted a resolution supporting a third political party. Robinson told them Henry Wallace should be president today and that Wallace might lead a third, or "people's" party.

The convention also upheld the decision of the executive board not to cooperate with the provision of the Taft-Hartley law which requires the filing of non-Communist affidavits by union officials before a union can get assistance from the National Labor Relations Board.

Further, the convention heard as its main speaker Rep. Vito Marcantonio of New York, idol of New York communists. Marcantonio asked the delegates to unite with all labor and "strive for unity with all peace-loving nations, particularly with Soviet Russia."

CIO Counsel, Lee Pressman, often accused of communist sympathies, shared the platform with Marcantonio, but confined his remarks to the new labor law. Pressman urged local unions to avoid use of NLRB procedures and to strike against employers who insisted on resorting to the Taft-Hartley law. To get around the union shop, which requires an NLRB-conducted vote, Pressman suggested that local unions try to bargain for the checkoff instead.

The secessionist movement, begun last winter after right-wingers complained of election irregularities and communist domination of the union, has been costly to the international. The treasurer's report lists $79,127 as having been spent to fight it. This amount is almost as much as the total assets of $79,623, which the union has left. Assets at the end of June, 1946, were $109,132 higher. During the past fiscal year, the union operated at a deficit of $120,104.

In membership, MMSW did not do so badly, its 108,625 membership equaling the 1944 peak, according to claims. About half of the 40 locals and 30,000 members who seceded and obtained charters from the Industrial Union of Marine and Shipbuilding Workers, CIO, as the Provisional Metal Council, are reported to have returned to the fold. Some did so after MMSW defeated them in NLRB elections before the Taft-Hartley law became fully effective August 22. The secessionists won eight elections.

Rebels Cut Adrift

Travis's resignation and the referendum have probably killed the CIO committee recommendation and cut the rebels adrift. The committee proposals, scheduled for consideration at the CIO convention, called for: 1, John J. Driscoll of Waterbury, Conn., secession leader, to resign as CIO secretary in Connecticut; 2, Travis to resign as president pending a proper election; and 3, withdrawal of the charters granted the secessionists by the Shipbuilders.

Under such a plan, Driscoll and his followers, including expelled district directors John Mankowski of Waterbury and Angelo Verdu of East St. Louis, would have been back in MMSW, had a voice in the selection of new officers, and been in a position to carry on the fight against the communist ideology which pervades the union leadership. Now they are outside and likely to stay there.

The CIO convention, faced with a *fait accompli*, is likely to leave matters as they are. It is not expected to upset the results of a referendum.

The convention rejected the minority election report which charged ballot box stuffing and fraudulent counting in the election last year of Robinson over Driscoll.

In this year's election strategy, Travis stepped out of the top post, but by no means removed himself from influence. Also, Robinson, who has been out of office since he resigned last March in the secession crisis, was slated to return to the executive board.

Travis ran for secretary-treasurer and Robinson for eastern vice president. Others on the "compromise" slate were: For president, Clark; for western vice president, Wesley Medill of Garfield, Utah, a right-winger; for district directors, William Mason, Butte, Mont., incumbent; Orville Larson, Globe, Ariz., incumbent; Jesse Van Camp, East St. Louis, administrator during the secession fight; Leonard Douglas, Flat River, Mo., incumbent; Homer Wilson, Strawberry, Tenn., who was supposed to step down from the eastern vice presidency to make room for Robinson; Al Pezzati, Waterbury, Conn., administrator during the secession fight; Chase Powers, San Francisco, incumbent; Robert Carlin, Sudbury, Ont., incumbent, and Ken Eckert, Cleveland, incumbent director of the casting division.

Efforts to get unanimous approval of the entire slate and thus demonstrate unity within MMSW to the CIO convention failed on the eve of the convention's close, although the whole slate was favored to overcome the opposition that developed.

Homer Wilson refused to step aside for Robinson and entered against him for re-election as eastern vice president. When that happened, Charles Wilson (no relation) of Bessemer, Ala., incumbent director in the district in which Homer Wilson was supposed to run, ran for re-election.

Homer Wilson has always been a Robinson supporter. In announcing against Robinson, he said he would not "red-bait" in his campaign, according to the communist Daily Worker. He is described as ambitious and desirous of the presidency. To step down to a district directorship would have been going the wrong way.

Clark, a member of the union since 1908, became western vice-president last March when Travis became president. He has been acting secretary-treasurer. His opponent, George Knott, New Mexico organizer, was not considered a threat. The same view was held of Walter Gilmore, Toledo, O., who ran against Travis.

Right-winger Medill was opposed by a Robinson supporter, Chet Smothermon, Carlsbad, N. M., for western vice president. In the district director races, only Larson, Pezzati, and Pow-

ers were unopposed at the election.

San Francisco was selected for next year's convention.

Anaconda Plans to Mine Low-Grade Ore at Butte

Anaconda Copper Mining Co. plans to spend $20,000,000 in the next five years on a project to mine low-grade ore at Butte, Mont., according to a recent announcement by C. F. Kelly, chairman of the company.

As the result of extensive exploration, sampling, and experimental work, more than 130,000,000 tons of ore are assured above the 3,400-ft. level, and large tonnage of similar ore are known to exist below that level. The ore is expected to yield about 20 lb. of copper per ton plus substantial values in silver and gold.

Daily ore production will run about 5,000 tons by the end of the third year, according to Mr. Kelly, 10,000 tons in the fourth year, and reach 15,000 tons by the end of the fifth year. The company's mill at Anaconda, Mont., will be remodeled to handle the additional tonnage. A site has been selected for the new shaft which will be concrete-lined and of large cross-sectional area.

Commenting upon current operations, Mr. Kelly said that development on the 4,200-ft. level, deepest in the district, has exposed two veins, known as the State and the High Ore veins, which are 2,000 ft. long and carry the same high values found at higher levels.

"With the carefully estimated tonnage now known to be available for production of low-grade ore," Mr. Kelly said, "there is now the assurance of a longer period of activity than it has been possible to state positively at any preceding time. It is now possible to visualize many years of a more varied and flexible mining operation than in the past."

Diamond Drilling Practice Review by R. Longyear

Improvements in modern diamond drilling practice were reviewed by R. D. Longyear, president, E. J. Longyear Co., at the annual meeting of the Canadian Diamond Drilling Association in Kirkland Lake, Ontario.

Improvement in corebarrel design gained impetus, he said, in 1943, after Stanley A. Tyler, consulting geologist for Jones & Laughlin Ore Co., suggested desirable changes. New corebarrels have been produced by the following companies: The Pickard corebarrel by E. J. Longyear Co.; the Series M barrel by Sprague & Henwood; and a design similar to the Series M barrel by the Sullivan Machinery Co. Principal features involved, according to Mr. Longyear, are: a swivel-type inner tube which tends to remain stationary while the bit and outer tube revolve; an inner tube extension which can be replaced when worn, and which can serve either as a case for holding the core lifter, or as a guide for the core lifter that seats in the bit; and a box-thread bit with sufficient room internally to allow the inner tube extension to reach practically to the stones in the end of the bit, thus eliminating most of the washing action of the circulating water on the core.

The Pickard corebarrel, he said, is also provided with a water cut-off head which shuts off circulating water when the core blocks. The resulting pressure increase registers on a gage which notifies the driller to stop, thus preventing grinding of the core.

In a Cripple Creek exploration project, the speaker said that core recovery increased from 60.5% with a rigid-type corebarrel to 95.4% with a Pickard-type corebarrel.

Some success has been achieved in the substitution of tungsten carbide and other carbide for bortz, most notably according to the speaker, in the Panama Canal where Carboloy inserts in blank bits were used for drilling certain soft formations.

The Tro-Pari drill-hole surveying instrument, made by the Trotter-Pajari Instrument Co., of Sudbury, was used with success in a 3,539-ft. hole in Michigan. The instrument is a compass and inclinometer supported in a gimbal mounting. Both compass and inclinometer are clamped by a clock-work which can be set to the nearest five minutes of elapsed time. The instrument is much quicker to operate, according to Mr. Longyear, than types using acid and gelatin because of the more accurate timing device.

He also mentioned the use of wires to lower surveying instruments down drill holes, but said that the danger of the wire breaking and consequent necessity of fishing the equipment out discouraged adoption of this method.

Much controlled deflection work has been done on the Marquette and Gogebic iron ranges during the last few years, Mr. Longyear said. Most of the work was done to make angle holes turn into a flatter position. As many as ten wedges were used in a single hole to reach an objective.

Commenting on improved methods of recording information secured by diamond drilling, the speaker cited Pickands, Mather & Co., which keeps records of taconite formations in black and white photographs; and the St. Joseph Lead Co., of Bonne Terre, Mo., and the Jones & Laughlin Ore Co. of Negaunee, Mich., which keep Kodachrome records of all core.

Pointing out many problems which still await solution, Mr. Longyear said, "There is need for a self-centering chuck; an automatic chuck; an efficient underreamer for underreaming casing in hard rock; an efficient and strong design of a flush-joint drive pipe. New drill rod standards which will more effectively fill the drill hole, reduce vibration, and increase the removal of cuttings, are needed. Such rods should have threads permitting quicker coupling and uncoupling, and yet not be subject to unscrewing in the drill hole. Experimental work in reverse circulation may lead to more efficient drilling methods. Also drilling procedure may be improved by such instruments as a tachometer, a torque indicator, a core block indicator, and some kind of automatic device for recording performance."

Mine Loans Continued R.F.C. Announces

The Reconstruction Finance Corporation announced on Sept. 2 that it is continuing to receive applications for mining loans under its existing powers to make loans to business enterprises.

This statement was made in order to clarify the corporation's lending authority in the mining field. Published statements in mining areas have recently indicated that the corporation had discontinued making mining loans. This erroneous assumption has undoubtedly arisen from the fact that the 80th Congress repealed Section 14 of the R.F.C. Act. That section had previously authorized the Corporation to make development loans to operators of gold, silver, tin and strategic mineral mines.

The R.F.C. points out that mining loans must be of such sound value or so secured as reasonably to assure retirement or repayment. The applicants must also certify that credit is not otherwise available on reasonable terms.

Applications for mining loans may be filed at the Washington office of the R.F.C.; 811 Vermont Avenue, N.W., or at any of the following regional field offices: Phoenix, Ariz.; Helena, Mont.; Reno, Nev.; Los Angeles, Calif.; San Francisco, Calif.; Salt Lake City, Utah; Joplin, Mo.; El Paso, Tex.; Seattle, Wash.; Spokane, Wash.; Portland, Ore.; Denver, Colo., and Fairbanks, Alaska.

Mining Congress Announces El Paso Convention Program

Sessions covering the following topics will be held at the 1947 Annual Metal Mining Convention of the American Mining Congress which meets at El Paso, Texas, October 27-29: Future of the mining industry, mining in Mexico, labor legislation and labor relations, developments in milling, manpower and mechanization, industry problems, and mining progress.

J. A. Krug, Secretary of the Interior, James F. Boyd, Director of the Bureau of Mines, and Fred Hartley, of the House Labor Committee, are among the key speakers who will discuss national problems.

XUM

ICC Starts Hearings on Application for Increase In Rail Freight Rates. Butler Complaint Pending

Amending their petition of July 3, 1947 to the Interstate Commerce Commission for increased freight rates, (*E. & M. J.*, August, 1947, page 104), the country's railroads asked for still higher rates on Sept. 5, alleging that in the meantime their operating costs had risen further. The increase asked in the line-haul carload rate on iron ore was put at 25 cents per ton (net or gross as rated), as compared with 15 cents previously asked. The alleged need for revision was based on the granting of a 15½c.-per-hour wage increase by an arbitration board to non-operating employees on Sept. 2, as well as on the increase in prices of railway fuel and other supplies that had taken place between June and September. An immediate 10% increase in all rates was asked when the hearings opened on Sept. 9 to aid the roads in meeting recent cost rises until the Commission should act on the long-range increases sought.

An increase in ore freight rates would have greatest impact on the efforts of mining companies to treat low-grade ores. In the last two years a special effort to obtain a reduced rate on such ores has been made by Butler Brothers, of St. Paul, Minn., largest independent on the Mesabi and a company that has pioneered the mining of low-grade ores. This effort has been part of the company's program of wider scope to aid the production of these ores. The full program calls for (1) Reduction in electric power rates to aid in mining low-grade ores. (2) Reduction of 22 cents in freight rates on concentrates. (3) Modification of royalty rates and tax (by a reduction of 20 cents). (4) Reduction of lake freight rates. (5) Modification of rail freight rates from lower lake ports.

Instead of reducing their rates, however, the railroads asked the Interstate Commerce Commission for an increase last year. This led eventually to the filing of a formal complaint by Butler Brothers, seeking relief. Docket number 29502 was given to it, and a hearing was held in April, 1947. After submitting direct testimony, the carriers asked for adjournment in order to digest the exhibit and prepare a rebuttal. The hearing was resumed in June and, as the case now stands, the complainants have asked time to study evidence presented by the carriers and to prepare their rebuttal. Thus the hearings on this complaint are still pending even while the Commission in separate hearings is taking testimony on the request of the railroads for higher rates. Although the cases are separate, the testimony of Butler Brothers supporting its complaint sheds much light on the iron-ore freight rate situation.

Testimony by Butler Bros.

The complainants hold that the earnings of the principal ore-carrying railroad (Duluth Missabe) have been excessive and that even with the increase in cost experienced in 1946, the present rates will yield far in excess of a reasonable return on the investments devoted to iron ore shipments. As testified at the hearing on No. 29502 by E. A. Wisco, of Butler Brothers, the Duluth Missabe Railway, one of the two principal ore-carrying railroads, had a "freight cost per gross ton" (not including investment charges) of $0.5324 for transporting iron ore in 1940. Adjusted to 1946 labor, material and fuel costs, this would be $0.6437 per ton for 28,014,860 tons carried. The Great Northern Ry. Co., the other chief ore-carrying road, had a corresponding cost per gross ton in 1940 for its ore traffic of $0.3875. With adjustment to 1946 costs, this becomes $0.5112, for 19,889,511 tons carried.

In comparison, the upper rail freight rate on iron ore from Minnesota ranges to Duluth-Superior was $0.9550 in 1946, $0.92 in the 1938-1945 period, and $0.91 in the 1921-1937 period.

Classifying Minnesota iron ores into (1) direct shipping ores from open pit or underground, (2) beneficiated ores, and (3) taconite, Mr. Wisco tabulated for the exhibit that accompanied his testimony in case No. 29502, figures on costs and income of the different mines to show that a reduction in iron ore transportation rates was necessary. Such a reduction will assist materially the production of the ores that are non-profitable at present, with resulting stimulation in employment, and, it is also asserted, a continuation of high levels of traffic and freight revenues for the carriers.

Rates Held Injurious

The inability of mining companies to produce Minnesota low-grade and underground ore on a profitable basis has encouraged the development of other iron ore fields, here and abroad. Mr. Wisco has cited that pig iron smelted in Belgium penetrated as far as Chicago before the war despite the duty of $1.12½ per ton then in effect. Today the duty is only 75c per ton under the "most-favored" clause of the Reciprocal Trade Agreement.

A continuation of unfavorable operating results derived from the production of beneficiated ores can readily divert from Minnesota half the output of these ores to fields where mining costs are more favorable, according to Mr. Wisco. The production of such ores over the five-year period 1941 to 1945 averaged 15,724,500, tons so the loss would be 7,862,250 tons representing 4,717,300 man-hours lost to Minnesota miners, or over 3,000 mining jobs, plus the transportation jobs lost.

In the second part of the exhibit, which deals with the earnings of the ore carriers, it is asserted that ore freight rates in effect in the past have produced excessive rates on the carriers' investments utilized in carrying the ore. Shippers have thus borne more than their just portion of the cost of service. From 1922 to 1944 the defendant carriers have transported approximately 95% of all Minnesota iron ore shipments and, in approximately the same period, have collected in iron-ore freight rates more than $200,000,000 over the amount required to provide a fair return on their Minnesota and Wisconsin freight service investments.

Alloys and Ceramics for High-Temperature Engines

A new group of "super metals" and ceramics will soon be available for turbo-jet, rocket, and atomic energy power plants, Clyde E. Williams, director of Battelle Memorial Institute, told the American Society of Mechanical Engineers at its fall meeting held recently in Salt Lake City, Utah.

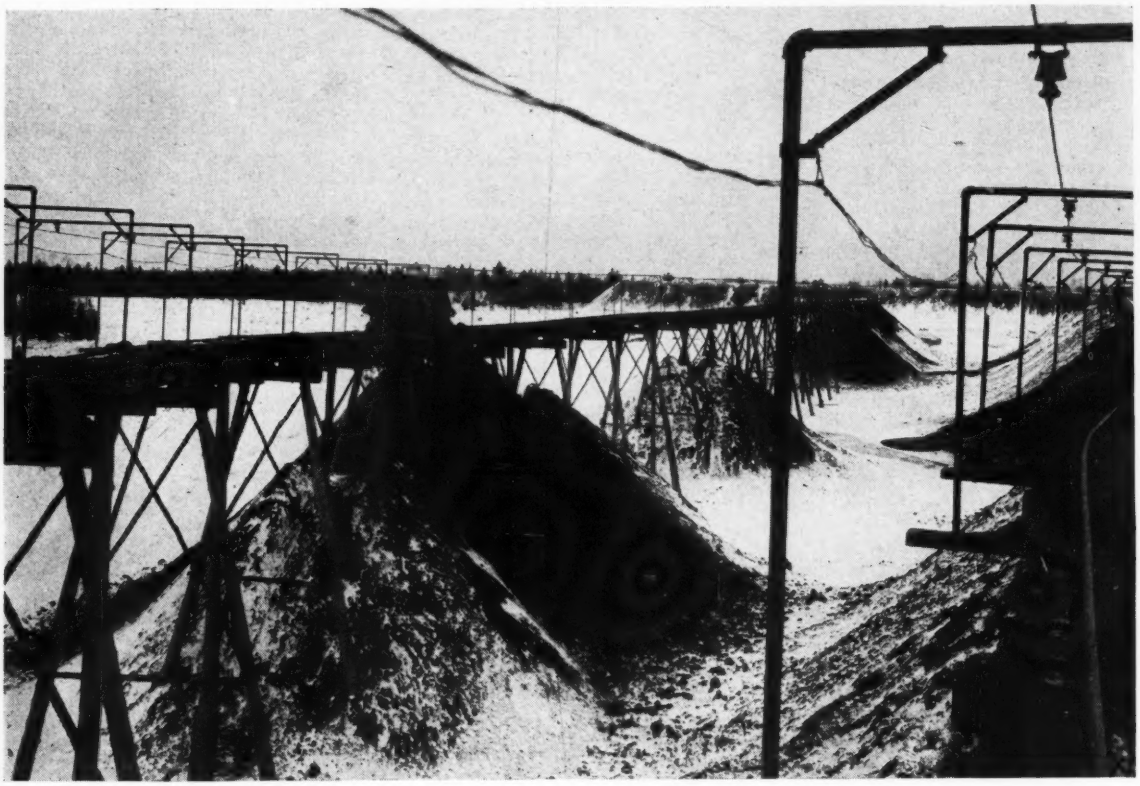
The gas turbine would not have been possible, he said, without the highly alloyed materials developed in the last 10 years. Materials had to be developed to withstand high stresses and temperatures up to 1,500 deg. F. Now engineers are pushing beyond this figure and are asking for materials to withstand 1,600 deg. F.

Alloys used for disk materials in the supercharger contain chromium-nickel-cobalt-iron, strengthened with molybdenum, tungsten, columbium, or titanium. Gas turbine blades used in superchargers and jet engines call for even more highly alloyed materials, practically free from iron. The strongest materials suitable for precision casting are the cobalt-base alloys containing from 40 to 70% cobalt and such other additions as chromium, molybdenum, nickel, tungsten, and columbium.

A series of alloys, containing upwards of 50% chromium, is showing great promise. An example is one that contains 60% chromium, 15 to 20% molybdenum, and the rest iron.

The high-temperature "super metals" will be useful, but to meet even more exacting conditions, as in atomic energy, ceramic materials will be called upon, Mr. Williams believes. Ceramic materials, made up from such highly refractory substances as oxides of beryllium, aluminum, magnesium, and zirconium, are the only known materials that will not melt or burn up at temperatures hitherto considered beyond the range of engineering materials. They may be used as coatings for metals, as structural combinations with metals, or as individual parts.

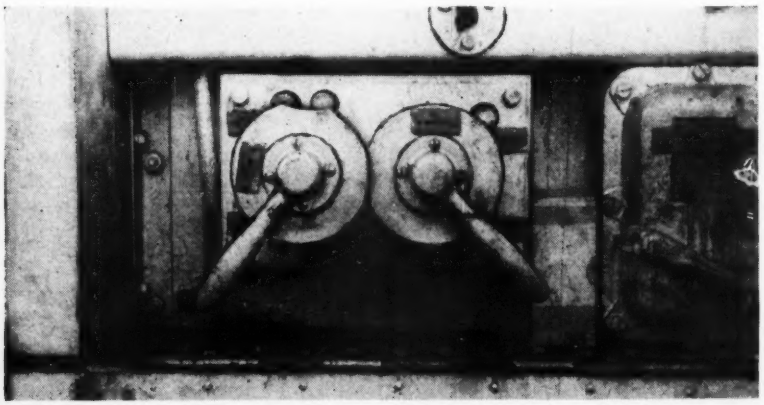
OPERATING IDEAS



Trolley-Operated Stockpiling Car

STOCKPILING OPERATIONS are carried out with this equipment at the Morris mine of the Inland Steel Co., Ishpeming, Mich. The gable-bottom ore car is trolley operated, and can be dumped automatically at any desired point by means of a small ramp positioned inside a rail which trips the mechanism that locks the car doors in position. This method of stockpiling is common in iron ore properties in the Lake Superior district. The trestles shown here are 40 ft. high. Capacity of the cars is 107 cu. ft. The stockpile in the background is that of the Lloyd mine of the Cleveland Cliffs Iron Co. Photo courtesy Lake Shore Engineering Co.

Simple Mechanical Interlock for Hoist



In certain hoisting operations it is often necessary to hold either the brake or the clutch control lever in a fixed position while the remaining lever is in operation. This simple mechanical interlock was used for such purposes on a small hoisting rig. In this photograph, note the clutch control lever is in a fixed position, while the brake control lever is free to operate. The small, curved notch in the outer edge of the brake control lever makes it possible to fix the brake lever while the clutch lever is in operation. This principle can be used for interlocks in other equipment.

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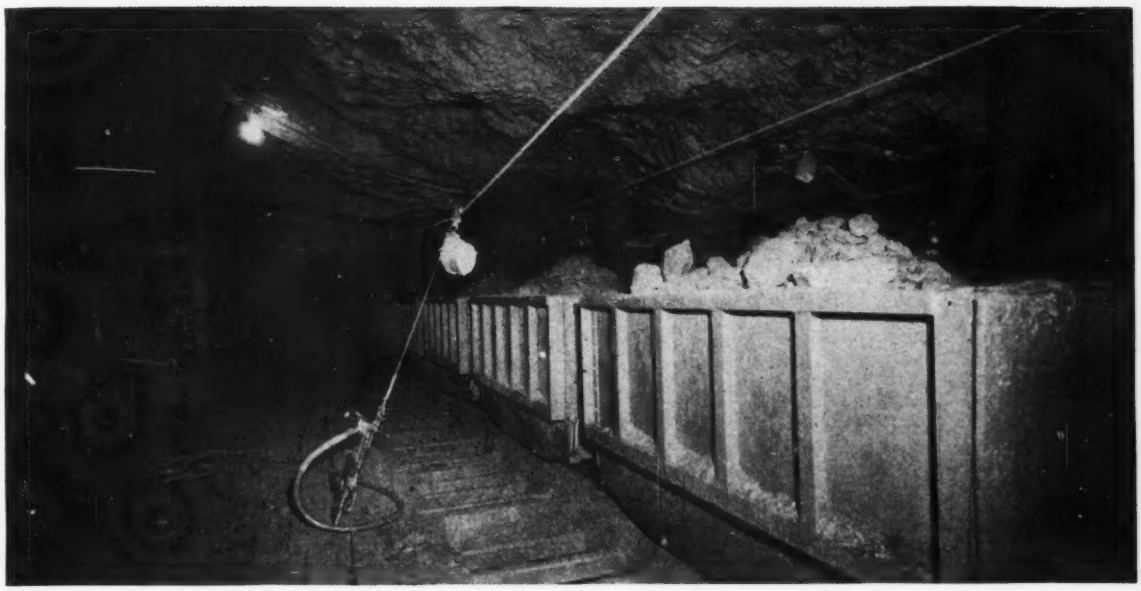
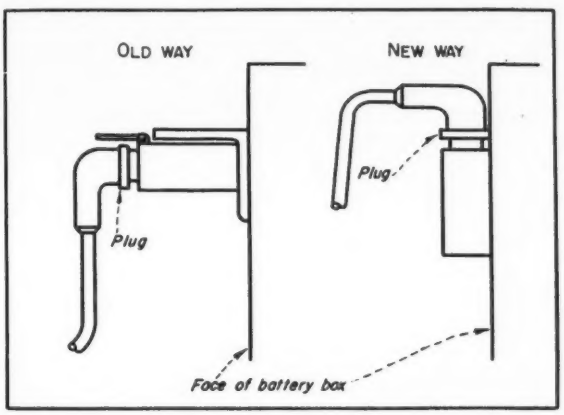


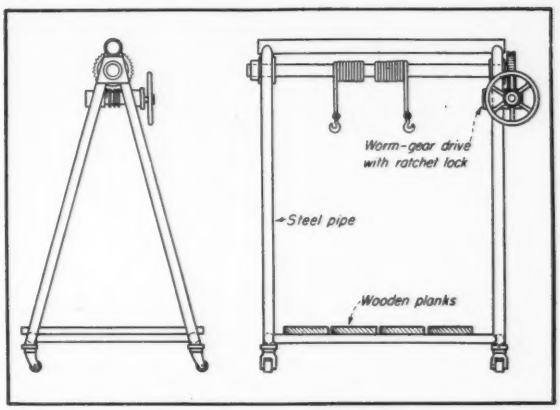
Boulder Buster Suspended From Cable

THIS BOULDER BUSTER is always within convenient reach at the grizzly station in the Sherwood Mine of the Inland Steel Co., Iron River, Mich. The air-operated machine is suspended by a small steel cable from a tension-type reel, which in turn is free to move along a cable over the grizzly as shown. Photo courtesy Lake Shore Engineering Co., Iron Mountain, Mich.



Plug Mount Changed to Stop Arcing

On many mine electric locomotives operating over rough tracks, the male and female plugs may shake apart. This produces a loose contact which may result in arcing, and ultimate ruin of the plug. Dick May, of Wallace, Idaho, reports that this difficulty can be remedied by mounting the plug assembly vertically as shown, instead of in the conventional horizontal manner. When the plugs are installed in the upright position, the upper plug has a tendency to shake into the lower plug and thus maintain a good connection. A ⅛-in. hole should be bored in the outside of the female shell to allow drainage of any water that might settle in the plug.



Portable Shop Crane Handles Heavy Parts

Heavy pieces of machinery and equipment can be lifted with this portable crane and transported to other places in the shop. Machine and electric shops of several Western mines have found the unit to be exceptionally valuable for handling parts while making repairs. To operate the crane, the planks are first removed from the bottom supports. Then the object is lifted by means of the worm-gear driven winch. Next, the planks are replaced as shown, and the object is lowered on the platform thus formed. Finally, the operator trundles the crane to any desired point. Thus mechanics can use their efforts for skilled work instead of heavy lifting.

NEW BOOKS

LABOR STANDARDS AND METAL MINING. By Tell Ertl and Thomas T. Read. Published by King's Crown Press, Columbia University, New York, N. Y. Pp. 81. Price, $1.50.

Because of the special problems of the metal mining industry, as well as because of its complexity, the Fair Labor Standards Act probably raised more conflicting opinions and more genuine puzzlement there than in any other industry. The wage and hour problems created in the mining industry by the Act are still not entirely settled, at least not to the point where all concerned are satisfied and confident in looking to the future.

This book does what it can to help cope with some of these problems. The history of the Fair Labor Standards Act is reviewed, and the reactions of many elements of the mining industry to the Act are described. The whole problem of portal-to-portal pay, for example, is taken up at some length.

Mr. Ertl has made a considerable study of the labor and wage economies obtainable by proper organization of shift work, including a swing, or special rotating shift. His latest analyses and plans are included in this book, together with other suggestions for meeting the increased wage costs indubitably brought about by the Act.

This book has an added interest in the marks it bears of the handiwork of the late Thomas T. Read, for years Vinton Professor of Mining at Columbia. Tom Read was an excellent writer, as his various books and articles testify, and although this present work allowed little scope for the dryly humorous approach at which he was so successful, it does uphold his reputation for clear and easily-understood writing.

MINING YEAR BOOK—1947. Compiled by Walter E. Skinner. Published by the Financial Times, 72 Coleman St., London, E.C.2, England. Price, 31s, 6d., net, postpaid abroad.

This is the 61st annual edition of this reference work, which includes up-to-date particulars on 860 mining companies operating in all parts of the world. Information given includes: names of directors, names of management staff, description of property and plant, operating results, capital, dividends, and financial results. Maps, plans, statistical tables, and various other data are also included. British Empire mines, of course, are most prominent, but important mining companies of other nationalities are likewise dealt with. Speaking for E. & M. J., one may say that past editions of this work have proved extremely useful.

HANDBOOK OF URANIUM MINERALS. By Jack DeMent, head of Fluorescence Laboratories, and H. C. Dake, Editor, The Mineralogist Magazine. Published by The Mineralogist Publishing Co., 329 Southeast 32nd Ave., Portland 15, Ore. Pp. 80. Price, $1.50.

Much valuable information on radioactive minerals has been gathered together in this concise paper-covered booklet. Among the interesting items is in a chapter on world occurrences of uranium minerals is a map of the mineral resources of Soviet Russia attributed to Professor Simon P. Alexandrov, Institute of Non-Ferrous Metals and Gold, Moscow, Russia. A chapter on prospecting and detecting radioactive minerals describes the use of radiographs, spinthariscopes (an instrument which reveals atomic disintegration by glow produced when atomic particles strike a screen of zinc sulphide phosphor), radioscopes, electroscopes, Geiger counters, ultraviolet-ray lamps, fluorescent bead tests, and other fluorchemical tests. The balance of the book is devoted to a discussion of carnotite and pitchblende, and a descriptive catalog of more than 150 uranium and thorium minerals.

MINE ECONOMICS (2nd edition). By S. J. Truscott. Published by Mining Publications, Ltd., 482 Salisbury House, London, E. C. 2. Pp. 366. Price 35 shillings.

The author is emeritus professor, Imperial College of Science and Technology (Royal School of Mines) and the University of London. His book deals with four main phases of mine economics: sampling; valuation; organization; and administration. It is a rehash and refurbishing of the subject rather than an assemblage of new ideas. Much of the subject matter is elementary; its value lies in the logical and understandable form of presentation. It should serve as a splendid manual for students and mining engineers newly embarked on their profession.

The introductory chapters take up fundamentals—how to take samples, reduce and record them, and compute averages. Classification of mineral reserves is explained at length, followed by discussions of beneficiation and marketing, and the evaluation of ore reserves in terms of purchase value, dividends and interest and life of the property. Company structures and the guiding principles of accounting, administration and labor are also discussed. The final chapter is devoted to management and supervision, including analysis of time and performance studies and efficiency engineering. An appendix contains representative financial statements of U. S., British, Australian, South African and Canadian mining companies.

MINE VALUATION (RAND PRACTICE). By J. Otter Jackson. Distributed by Louis Gordon, Johannesburg, Transvaal, South Africa. Pp. 155. Price $3.50.

This book is a valuable addition to the mining engineer's library, even though it has special application to the Rand gold mines. The author points out that valuation methods among the various mines are not standardized, and his book is an effort to smooth out some of the difficulties.

The American and Canadian mining engineer will have to get used to Rand mining terms in order to gain full benefit from the text. All values are expressed in pennyweights, and "in.-dwt." takes the place of foot dollars in the calculations. "Ounces per square fathom broken" sounds a little strange, and a chapter is devoted to "mine call factor," which is simply the ratio of actual to theoretical recovery.

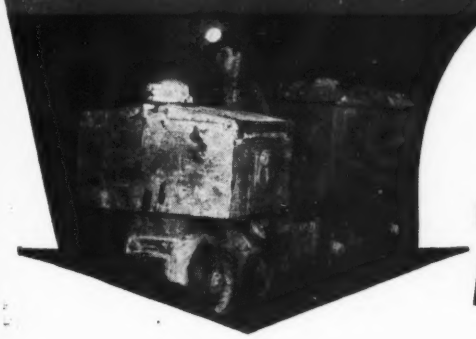
The author has evidently had wide practical experience, and the text abounds with remarks that ring the bell with any engineer who has struggled with mine valuation. "Mine valuation," he says, "deals with the practical side of the economics of mining operations; it depends largely for its efficiency on good sampling methods, reliable assaying, and much common sense based on experience." And again, "Anything other than good sampling is not only a waste of time and money, but also a positive danger to mine valuation." He points out that discounting high assay values in narrow reefs is usual practice in order to avoid over-valuation, but he warns against the danger of under-valuation in doing so.

As it is the privilege of the reviewer to look for shortcomings, I might point out that the author would have enhanced the value of his book greatly by including a good index. Only a list of chapter headings is given.

W. F. Boericke.

BOOKS continued on p. 118.

SAFE POWER



Avoid
LOST PRODUCTION TIME...USE
EXIDE-IRONCLAD POWER

There are no production slowdowns, no time out for adjustments, when electric haulage equipment is on the job... and the motive power is Exide-Ironclad power. Locomotives, trammers and shuttle cars move steadily along, straight through to the end of every shift.

The extra capacity and ruggedness of Exide-Ironclad Batteries are due to their special construction which differs from all other batteries. A major difference is in the positive plate. This consists of a series of slotted tubes which contain the active material. So fine are these slots that, while they permit easy access of the electrolyte, they prevent the active material from readily washing out. Not only does this add to life of plates . . . and battery . . . it also provides higher power ability and capacity, assuring dependable, day long performance with maximum safety and minimum maintenance.

Speed up production and reduce haulage costs. Choose Exide-Ironclad Batteries for your mine, quarry or tunnel operation. If you have a special battery problem, or wish more detailed information, send for booklet Form 1982.

ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

XUM

EQUIPMENT NEWS

TIN CONCENTRATE, arriving from Bolivia, is unloaded at the Texas tin smelter by a Baker fork truck, made by Baker-Raulang Co., Cleveland 13, Ohio. Much of the materials handling in the smelter is done by these trucks, in fact the plant operation was designed around them.

Improved Respirator

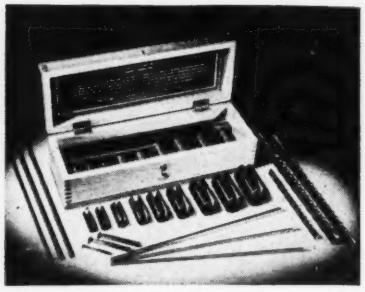
A respirator incorporating a new type of dust filter that is said to be 40 times as effective as an ordinary filter has been announced by American Optical Co., Southbridge, Mass. The new filter consists of a felt that has been chemically treated to improve greatly its dust-catching capabilities. The illustration shows a filter after a test of the new respirator in which the worker was sprayed with carbon black at close range. Approved by the U. S. Bureau of Mines, the new respirator protects workers against toxic dusts such as lead or arsenic, silicosis-producing dusts, and nuisance dusts.

Air Line Safety Check

Since the first air tool began operating, there has existed the danger of a whipping air hose if a line broke or came off while the tool was being used. The Danielson safety valve, produced by Danielson Safety Valves, Inc., 718 MacDonald Ave., Richmond, Calif., was designed to avoid this danger. When the Danielson valve is used, a broken air line merely means that the air flow will be cut off. Also, if a major leak is present in the line, the valve will not release. Water and grit are removed automatically from the air lines at the start of each shift, and hoses may be changed from one tool to another without going back to shut off air valves. Write the manufacturer for full details.

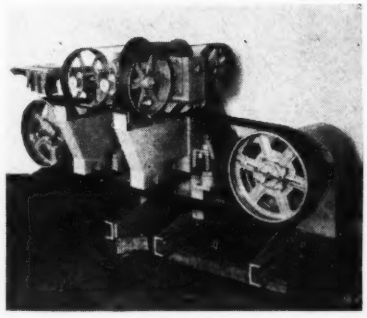
To Patch Air Tubing

Torn ventilation tubing can be patched in a matter of minutes by using the Harmon Vent-Patch, a device made by E. Harmon, 5617 Walnut St., Pittsburgh 6, Pa., who is now on the staff of the U. S. Bureau of Mines. Mr. Harmon was formerly ventilation engineer for Miami Copper Co. The Vent-Patch consists of two metal plates, suitably shaped and connected with a brass screw. In use, one plate is pushed through the tear in the tubing, adjusted to cover the hole, and then tightened against the other plate by drawing up the screw.



Keyways Cut on Job

Keyways of any standard width and any depth can be cut in the field in gears, milling cutters, pulley hubs, collars, or other parts by means of the Minute Man keyway broach kit recently announced by the Du Mont Corporation, Greenfield, Mass. Shown in the accompanying photograph, the kit includes all necessary parts. With a hand-operated arbor press, the proper size bushing for the given bore is selected and dropped into the bore. The broach of the desired width is then inserted in a slot in the bushing and pressed through the number of times necessary to get the desired depth. Two passes are usually enough. The kit is described fully in a catalog available from the manufacturer.



Magnetic Separator

A cross-belt magnetic separator of new design was recently announced by Magnetic Engineering & Mfg. Co., Clifton, N. J. The new machine, pictured herewith, is the MEMCO-Wetherill magnetic separator, and it is designed for concentration of feebly-magnetic ores, removal of iron

71-YEAR-OLD ROOTS BLOWER STILL ON JOB

. . . making mineral wool from iron slag

This cupola blower, fitted with wooden impellers, was installed in 1876 at the Stanhope (N. J.), plant of U. S. Mineral Wool Company (world's oldest manufacturer of mineral wool). Used in making mineral wool insulation from iron slag, it's still working faithfully, 24 hours a day, 7 days a week.

Amazing as this record is, we'll stack our modern blowers against it. Advanced engineering, new materials and methods make R-C Blowers better than ever before. Then, our *dual-ability* to build either Rotary or Centrifugal units permits matching the blower precisely to the job —for better all-round performance, economy and long life.

ROOTS-CONNERSVILLE BLOWER CORP.
710 Washington Ave., Connersville, Indiana

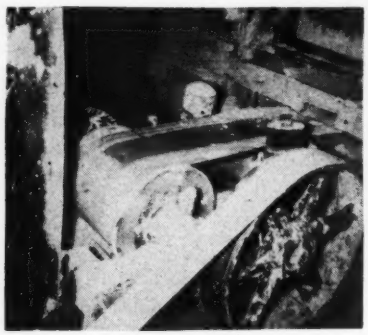
Insulation process completed by R-C Blowers

Air from compact, built-in R-C Blowers carries this same mineral wool into every nook and corner for building insulation. Similar units furnish air for widely varying uses—from ice-making to portable forges. High-capacity Rotary or Centrifugal equipment moves or measures air and gases in almost every industry, with a proved record for durability and economy.

You'll find it profitable to consult us on any problem of moving gas or air.

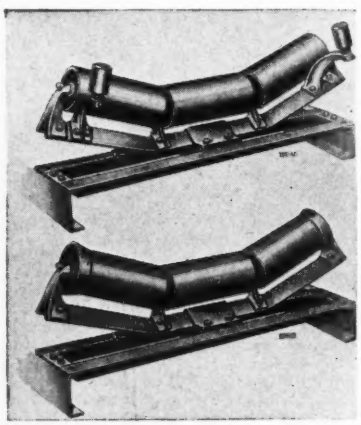
ROOTS-CONNERSVILLE BLOWER BUILDERS R-C SINCE 1854
ROTARY CENTRIFUGAL
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS
★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

or magnetic contaminants, and for extremely clean separations of magnetic and non-magnetic material generally. The general principles of the Wetherill-type separator are employed, but a number of mechanical improvements have been made. Standard sizes include a range of from 6-in. to 18-in. in the main conveyor belt, with from two to ten cross belts.



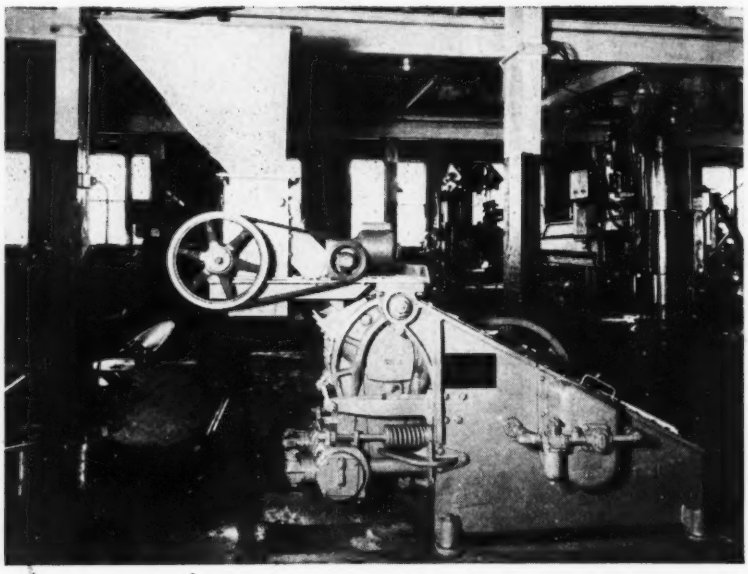
Alnico Magnetic Pulley

Using Alnico alloy magnets, the new magnetic pulley now being manufactured by Eriez Manufacturing Co., Erie, Pa., requires no electric current to energize it. The unit has been tested at various locations for removal of tramp iron from conveyor systems. Full details will be furnished by the manufacturer.



Self-Aligning Idler

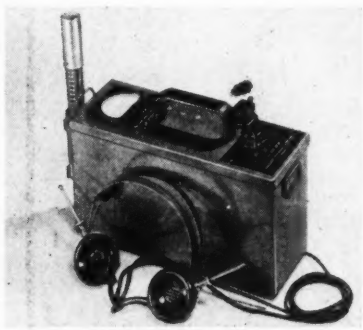
An improved type of self-aligning idler for belt conveyor service was announced recently by Jeffrey Manufacturing Co., Columbus 16, Ohio. Illustrated are the positive type idler (above) with guide rollers, and the idler with flared friction-type end pulleys (below). The manufacturer announces that a new catalog (No. 785) is now ready for distribution, and that it is the most complete handbook on belt conveyors ever published.



SPECIAL SET-UP of a Kue-Ken crusher includes a hopper, a feeder driven by a gear-motor, and, for the crusher, an overload safety device, an automatic pressure switch, and an oil filter. This unit was built for crushing quartz crystals, a job for which the patented Kue-Ken principle of crushing without rubbing was ideal. The Kue-Ken jaw plates do not abrade as rapidly as those of ordinary crushers, hence will not contaminate the quartz with steel fragments.

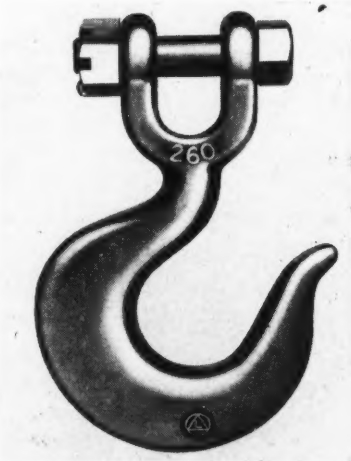
Air Cleaner for Coal

An entirely new Airflow coal cleaner has been announced by Roberts & Schaefer Co., 307 N. Michigan Ave., Chicago 1, Ill. Of interest to the metal field is the fact that this new cleaner is said to be effective on coal finer than 10 mesh. The unit offers a cleaning deck and a resistance pack that oscillate as an integral unit with short rapid strokes. Air volume required is said to be less than on former models, and various other changes have been made. Fine ash sifts through the deck and is removed by screw conveyors.



Portable Geiger Counter

A new model of portable radiation counter was announced recently by Instrument Development Laboratories, 223-233 West Erie St., Chicago 10, Ill. It is intended for qualitative and semi-quantitative measurement of X, gamma, and beta radiation. The instrument measures 11x4x6 in., and weighs 9½ lb.



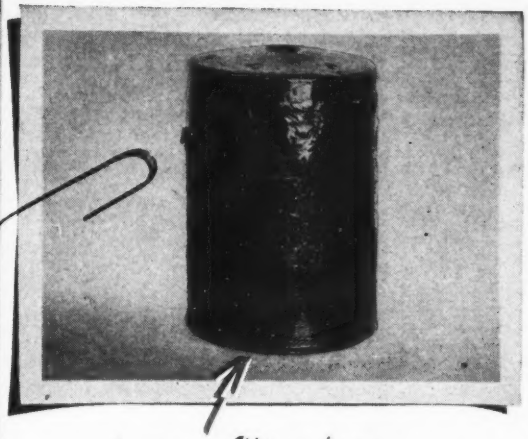
Fast-Acting Clevis Hook

Unusual speed of attachment and maximum safety feature the new clevis hook recently added to the line of drop-forged wire rope and chain fittings made by Thomas Laughlin Co., Portland 6, Maine. By use of bolt, slotted nut, and cotter pin, the hook is easily switched from one job to

XUM

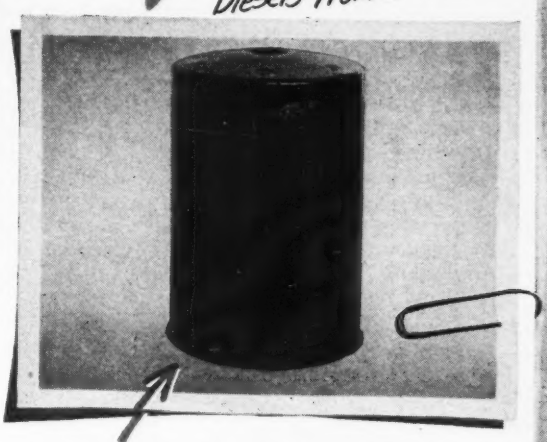
LUBE MEMO

How Joe stopped Filter Clogging



Joe says filters have gummed up like this after about 600 hours on oil he's been using

Joe says nothing but RPM Delo Oil in his Diesels from now on



Here's how the filter looked after 600 hours on RPM Delo Diesel Engine Lubricating Oil

Joe finds RPM Delo Oil keeps filters clean because:

1. It's compounded to resist oxidation and minimize sludge.
2. Its "detergent" cuts down sludge.
3. It remains stable in the presence of moisture.

DIESEL ENGINE RPM DELO LUBRICATING OIL

Set up trial on RPM Delo Oil Today!

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THE CALIFORNIA COMPANY • Denver, Colo.
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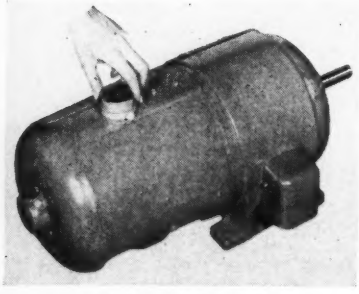
another, yet all safety requirements are met. The hook can be supplied with the Laughlin safety latch, or with reversed jaw, on special order. It is made of drop-forged, heat-treated steel in four of the most popular hook sizes: 1½, 2, 3, and 5 tons.

A 20-TON BLOW is delivered by this device, a tool called Drive-It, which instantly drives anchor bolts up to 3 in. into concrete, punches holes through ⅜-in. steel plate, or rivets two such plates. Power for the blow comes from a charge of special powder in a small cartridge of .38 caliber size. The tool cannot be used as a gun. It is made by Powder Power Tool Corporation, 618 N. Vancouver Ave., Portland, Ore.



Variable Speed Motors

A new line of Tri-Clad brush-shifting, adjustable-speed induction motors has been announced by the Motor Division of the General Electric Co., Schenectady, N. Y. Available in ratings from 3 to 50 hp., (220, 440, and 550 volts), the new motor features stepless speed adjustment over a 3:1 ratio by simply turning a dial. Remote speed control is possible through a long cable shaft, or a small pilot motor can be hooked up to turn the control mechanism.

Tough Slurry Pump

With wearing parts cast centrifugally of a chromium carbide alloy called Diamond Alloy, the new slurry pumps recently announced by Pettibone Mulliken Corporation, 4710 West Division St., Chicago 51, Ill., are said to provide increased pump life and efficiency. The alloy used is said to be excellent for withstanding abrasion and corrosion. The pumps are described in a new 16-page bulletin available from the manufacturer.

Rayon Conveyor Belt

Conveyor belt with rayon cord plies as a strength member was announced recently by Rabestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. The new belt, designed to meet the needs of coal or metal mines and of quarries, features higher tensile strength in keeping with the trend toward longer belts, higher lifts, and heavier loads.

Advantages claimed by the manufacturer for the new belt are: easy troughing, fiber resilience, use with conventional idlers and pulleys, ease of field-splicing, possibility of use over longer distances to eliminate troublesome transfer points.

Portable Arc Welder

A new portable gasoline-driven d.c. arc welder is now being manufactured by Hollup Corporation, a division of National Cylinder Gas Co., 205 West Wacker Drive, Chicago, Ill. The unit weighs 315 lb. and is small enough to be carried in a jeep, a station wagon, or even the trunk compartments of some cars. The welder is rated at 150 amp. at 30 v. Electrodes up to and including 5/32-in., and certain 3/16-in. rods, may be used.

INDUSTRIAL NOTES

John M. Martin, manager of the Pittsburgh office, has been appointed as one of the two assistant general managers of the Cellulose Products Department of **Hercules Powder Co.**

American Cyanamid Co., Stamford, Conn., has been appointed as technical representative for the Dutch State Mines organization to develop applications of its ore and coal treatment processes in the United States and elsewhere.

Gar Wood Industries has named **E. D. Wallace** as sales manager of its Buckeye Traction Ditcher Division, Findley, Ohio.

L. A. Weom has been appointed manager of the Pump Division of **Fairbanks Morse & Co.**

Clipper Manufacturing Co., makers of masonry saws, portable hoists, and blades, announces the opening of a new factory branch at 208 Noble Court, Cleveland 13, Ohio.

Roy E. McCluskey has been made vice-president in charge of sales of **R. G. LeTourneau, Inc.,** Peoria, Ill.

F. G. Hoyt has been appointed general manager of the woven wire fabrics division of **John A. Roebling's Sons Co.,** Trenton, N. J.

BULLETINS

Industrial Diamonds. A monthly bulletin giving abstracts of articles dealing with properties and uses of industrial diamonds may be had for the asking from Distributors (1946) Ltd., St. Andrew's House, 32-34 Holburn Viaduct, London, E C. 1, England.

Car Emptier. Robins Conveyors Division of Hewitt-Robins, Inc., Passaic, N. J., has issued a new bulletin describing the Robins car shake-out, a vibrating device that greatly speeds up unloading of hopper-bottom railroad cars.

Processing Equipment. A new bulletin has been released by Sprout-Waldron & Co., Muncy, Pa., describing the company's equipment for size reduction, mixing and blending, pelleting, and other phases of materials handling.

Rock Drill Lubricants. Two folders describing how and why Sta-Put lubricants overcome the adverse conditions associated with operation of rock drills and other pneumatic tools are now available from E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.

Welding Accessories. Metal & Thermit Corporation, 120 Broadway, New York, N. Y., has issued a bulletin describing the company's complete line of welding accessories.

Electric Shovel. A new 40-page bulletin has been prepared to present the various design and operating features of the P & H 1055 electric shovel, which include the Magnetorque electric swing, a device by which swing frictions are eliminated. For a copy of this bulletin (X-104), write Harnischfeger Corporation, Excavator Division, 4400 West National Ave., Milwaukee 14, Wis.

Fire Hose. A new catalog section on its industrial fire hose has been issued by B. F. Goodrich Co., Akron, Ohio.

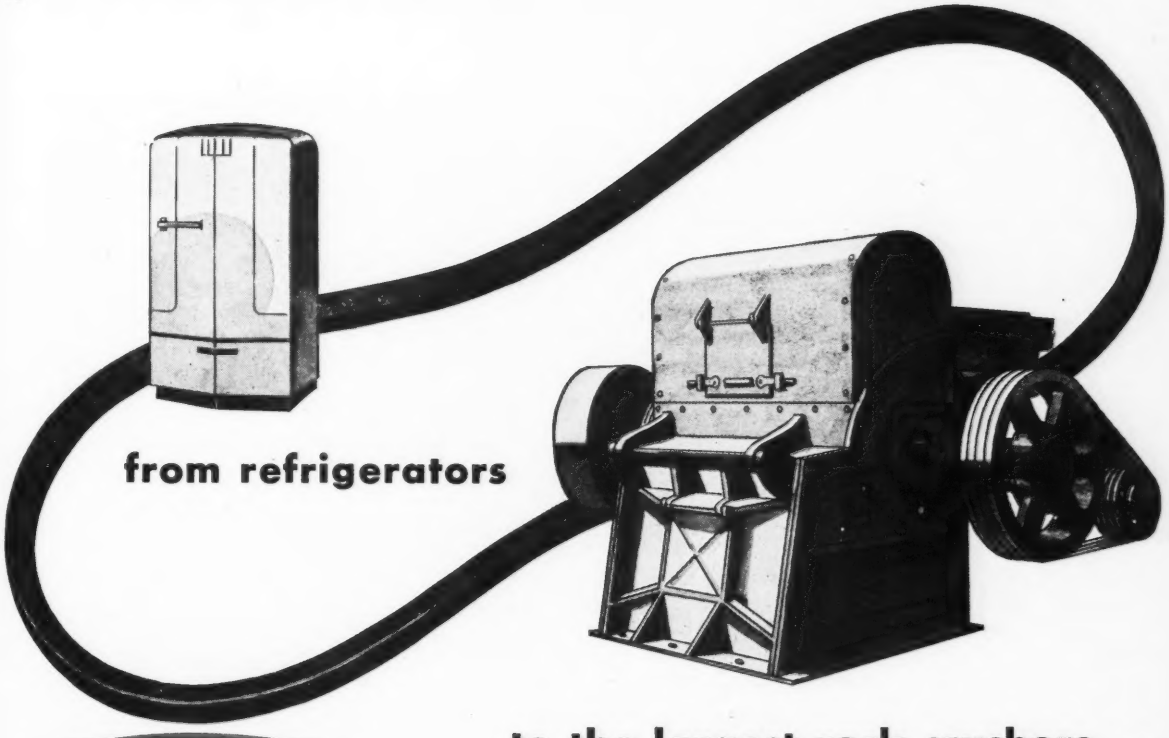
Sintering Hearths. Design and operating data for Mace sintering hearths are given in a new catalog of the Mace Co., 2763 Blake St., Denver 5, Colo.

Cable-Controlled Bulldozers. Basic specifications and production features of the new cable-controlled angling blade bulldozers are stressed in the booklet describing them recently published by Caterpillar Tractor Co., Peoria 8, Ill.

Sand Filters. Automatic backwash sand filters are described in a new bulletin of the Hardinge Co., 240 Arch St., York, Pa.

Coal Hauler. Euclid Road Machinery Co., Cleveland 17, Ohio, has prepared a catalog (No. 216) describing their 32-ton bottom-dump Euclid coal hauler for use in open pit mines.

Rock Truck. Catalog No. 105 of Euclid Road Machinery Co., Cleveland 17, Ohio, describes the company's 22-ton rear-dump Euclid truck for mining or construction jobs. The truck is powered by a 275-hp. diesel engine.



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PERSONAL NEWS

Dr. James Boyd, former dean of the Colorado School of Mines, takes the oath as Director of the Bureau of Mines while Secretary of the Interior J. A. Krug (right) looks on. Acting Chief Clerk Clarence C. Davison administers the oath, and behind him is Oscar L. Chapman, Undersecretary of the Interior. The ceremony took place August 27 in Secretary Krug's office, following President Truman's appointment of Dr. Boyd to the position.

C. H. Burgess, geologist, has joined the M. A. Hanna Co. on the Cuyuna iron range. He has established residence at Deerwood, Minn.

Dr. Bruce S. Old has been appointed to the Atomic Energy Commission, Division of Research, in the capacity of chief metallurgist. Dr. Old will continue his present work with Arthur D. Little, Inc., Cambridge, Mass., industrial research laboratory, and will

Dr. Bruce S. Old

serve the Commission on a part-time leave of absence from his firm. During the war, he served as Commander in the Office of Research and Invention of the Navy, where he was engaged in planning and coordinating research on guided missiles, jet propulsion, and metallurgy.

John V. Collis, for eleven years a director and for three years chairman of the company's executive committee, has been elected president of the Federal Chemical Co., Tennessee, succeeding **Claude T. Brown,** who has resigned. **Jefferson D. Stewart, Jr.,** has become vice president.

W. T. Warren has resigned his position as of Sept. 1, as technical consultant for the International Explosives Corp., Reno, Nev. He may now be reached at the WTW Ranch, P.O. Box 26, Steamboat, Nev.

Dr. George A. Kiersch, geological engineer, has joined the faculty of the department of geology, Montana School of Mines. Dr. Kiersch is a graduate of the Colorado School of Mines and holds a Ph.D. degree in mining geology and mineral engineering from the University of Arizona.

Guy E. Ingersoll has accepted a position as associate professor of mining and metallurgy at the Texas College of Mines and Metallurgy, El Paso. For the past four and one-half years, Mr. Ingersoll has been supervising engineer in the mining section of Reconstruction Finance Corporation, at the El Paso office.

A. T. Ahlston has been appointed manager of Sierra Leone Chrome Mines Co. Ltd. in Australia. He was formerly on the staff of Anglo-Oriental (Malaya) Ltd.

Donald B. Gillies, vice president of the Republic Steel Corp., has become president of the Lake Superior Iron Ore Association, succeeding **R. C. Allen,** vice president of Oglebay, Norton & Co., who asked to be relieved as president and director of the Association. Mr. Allen's seat on the board will be taken by **H. F. Taylor** of Oglebay, Norton. **P. D. Block, Jr.,** Inland Steel Co., will succeed **C. B. Randall,** also of Inland, as a director.

L. H. Chapman, Magdalena Unit superintendent for American Smelting & Refining Co., has been transferred to the Tucson office of the company. **G. J. Matthews,** mine superintendent, Tucson, will succeed Mr. Chapman at Magdalena, and chief engineer **J. V. Desvaux** will replace Mr. Matthews at the mine.

F. W. Stewart, geologist in charge of western operations of the American Metal Co., Ltd., has moved to Salt Lake City. The company carries out its development and exploration projects in the West through its subsidiary, the American Metal Company of Colorado, with headquarters at 232 Judge Building, Salt Lake City.

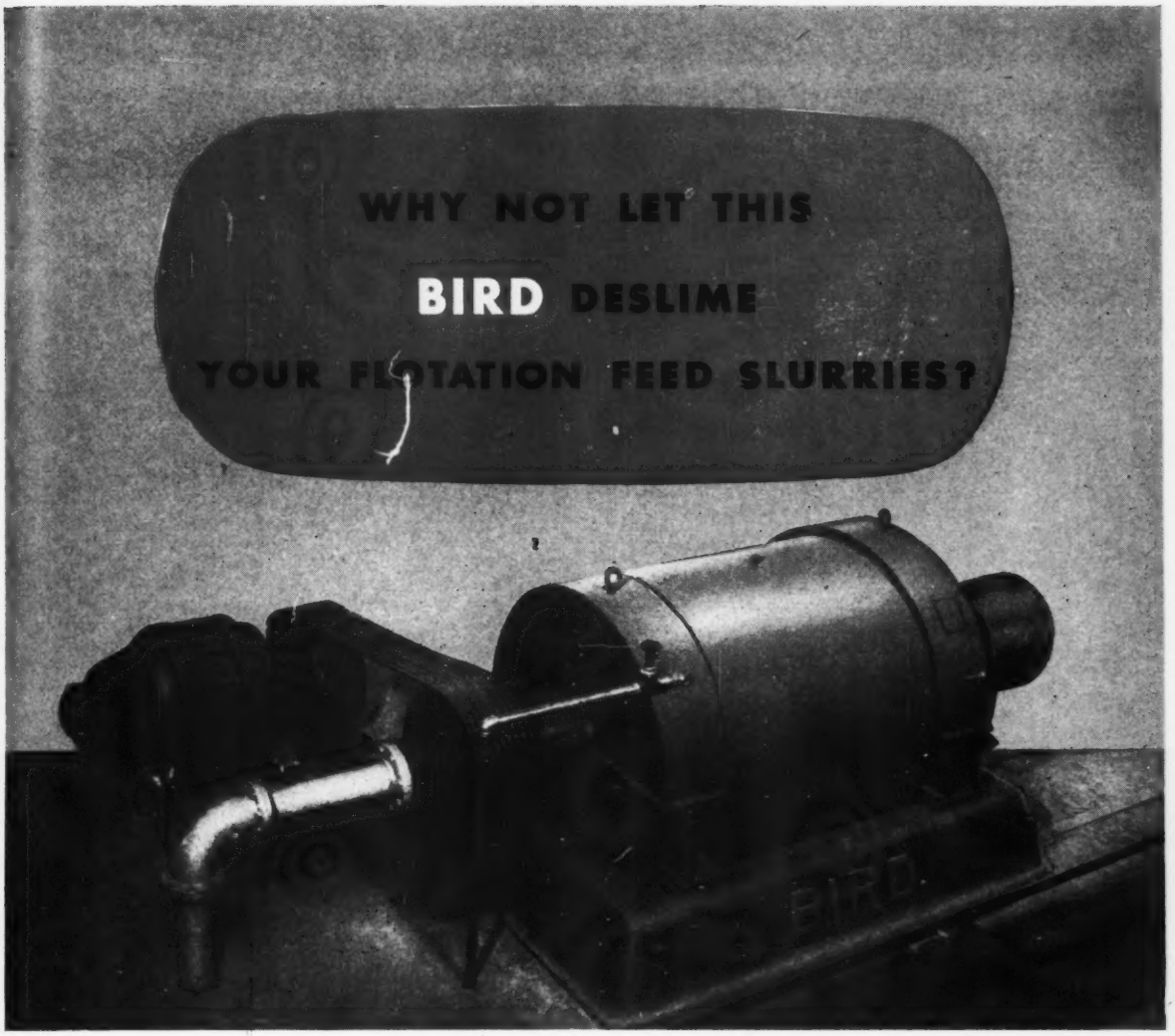
Church Holmes, who has been engineer with the Sunshine Mining Co., Wallace, Idaho, for many years, has resigned to join the Nichols Engineering & Research Corporation, New York, and will have charge of the Sintering Machinery Company, of Netcong, N. J. Mr. Holmes was engaged in the experimental work and construction of Sunshine's electrolytic antimony recovery plant and laster, and was in charge of their placer-dredge operations in Alaska.

John W. Dent, formerly connected with Thompson-Weinman Co., Cartersville, Ga., as production manager of all their plants, has been appointed vice president and general manager of the Calcium Products Division, Georgia Marble Co., at Tate, Ga. Under Mr. Dent's direction the Divi-

John W. Dent

sion will expand crushing operations and will start construction of additional plants to produce high-grade wet ground calcium carbonate pigment. **William B. Tate, Jr.,** formerly with the company's engineering department, has become sales manager of the Division.

John Stitzer, Chisholm, Minn., mining engineer, formerly a sales representative for the Goodman Mfg. Co.,



You may be surprised and delighted at the way this BIRD Centrifugal Classifier steps up cell capacity and cuts down reagent cost.

Slimes as fine as 2 microns are separated without chemical dispersion.

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Isn't this something to look into?

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Chicago, has joined the engineering department of the Snyder Mining Co., and is located at the Shenango mine office at Chisholm, on the Mesabi iron range.

OBITUARIES

Hamilton M. Brush, 61, retired vice president and a former director of the American Smelting and Refining Co., New York, died at his home in Greenwich, Conn., on Aug. 26. Mr. Brush became associated with the firm in 1910. His father, the late Edward Brush, had been its first secretary. Hamilton Brush was elected a director in 1921 and became vice president in charge of sales two years later. He retired as vice president in 1938 and as a director of the company in 1940.

Frank Armstrong, 72, for the past 20 years one of the managing partners in the firm of Pickands, Mather & Co., Cleveland, and prominent in the iron and steel industry, died at his summer home at Novelty, Ohio, Sept. 13. A native of Ireland, Mr. Armstrong came to this country to stay in 1893.

Earl E. Gardanier, 66, general manager of Horse Heaven Mines, Inc., and Cordero Mining Co., subsidiaries of Sun Oil Co., died in Palo Alto, Calif., on August 4.

Herman H. Heyne, 60, died August 19 in the Chino Hospital, Santa Rita, N. M., after a brief illness. He was chief chemist for the Black Hawk Consolidated Mines Co. for 10 years, and for the past three years had been employed by the American Smelting & Refining Co. at Vanadium, Grant County, N. M.

Albert V. Smith died in Pasadena, Calif., August 11. A mining engineer, he was employed by American companies operating in Chile, Mexico, Central America and the Philippines. For several years Mr. Smith was safety engineer for the Division of Industrial Safety of the California Department of Industrial Relations.

Vernon S. Wright, N. H. Ryan and **A. G. Geols** died August 18 as the result of an accident in the upper Bridge River mine of Pacific (Eastern) Mines, Ltd. Mr. Wright had been in charge of diamond drilling for Boyles Bros. Drilling Co., Ltd.

Winfield F. Ritter, 69, died August 21 in El Paso, Texas. At one time Mr. Ritter managed the old 85 Mine which was later sold to Phelps Dodge.

John A. Wood and **Ted Chapman** have opened an office in the Lincoln Building, Albuquerque, N. M., to engage in mining, metallurgical and geological service. They have been associated in the extraction of rare metals from the old Harding mine in Rio Arriba County for some time.

Earle W. McMullen 60, director of research for the Eagle-Picher Company, Joplin, and prominent in national chemical and engineering

EARLE W. McMULLEN

circles, died Aug. 27 in Mount Carmel hospital, Pittsburg, Kan., following a nine-week illness.

Charles Osborne Wraith, 61, of Selukwe, Southern Rhodesia, died May 22. Mr. Wraith surveyed and reported on copper properties in the Belgian Congo and asbestos properties in Eastern Transvaal. In 1926 he entered the service of the Rhodesia Chrome Mines, Ltd., Selukwe, where he was manager of all the region's chrome mines and assistant consulting engineer of the group until 1945.

Henry A. Robinson, who retired last year as chief engineer of Oliver Iron Mining Co.'s former Virginia-Eveleth District on the Mesabi, died Sept. 11 in Virginia, Minn., aged 65.

Andrew Edward Johnson, 69, mechanical superintendent of the Westport Mill, laboratories and testing plant of the Dorr Co., Westport, Conn., died Aug. 15. Associated with John Van Nostrand Dorr ever since 1903, Mr. Johnson witnessed and took part in many of Mr. Dorr's engineering developments in the West.

Theodore D. Benjovsky died in Denver Aug. 19, following a short illness. Born in Leadville, Colo., in 1884 and a graduate of the Colorado School of Mines in 1910, Mr. Benjovsky had been engaged in mining in Colorado, Nevada, Utah and New Mexico. The last twelve years of his life were spent in New Mexico, where he conducted mining and milling operations in Grant County and later became head of the mineral department of the New Mexico Bureau of Mines and Mineral Resources, which position he held at the time of his death.

Oliver Lasby Flanagan died July 21 in Toronto. A graduate of the University of Toronto, he was associated with important hydraulic and mining developments in Canada, including the construction of the Island Falls Power development of Hudson Bay Mining and Smelting Co. on the Churchill River.

John Warder Shotwell, 53, assistant general manager, Saudi Arabian Mining Syndicate, Mahad, Saudi Arabia, died Aug. 27 in Khartoum Hospital, Sudan, Africa. A graduate of Missouri School of Mines in 1915, Mr. Shotwell's experiences carried him to many parts of the world, including Mexico, Ecuador, Bolivia, Peru, and Colombia.

LETTERS

The British Scene

The Editor,

My work recently took me across North America, and I was impressed by the difficulty mining men in the United States sometimes felt in understanding what's going on in Britain today, notably in its bomb-battered but still strong-beating heart, London. We need all the mutual understanding we can manage if our two countries are to stand together against the anti-democratic forces so clamorous in the world just now, and I can think of no better foundation for such understanding than the common bonds of our profession. Mining and food-production between them underwrite the standard of living civilization can enjoy, and, although Britain no longer has a significant home production of engineering metals other than iron, we are still the center of a large and widespread imperial mining industry.

In Britain we've become acutely aware of the interlock between technology, politics and economics. We feel they're strands in a rope which binds the workaday world together. While I was in the States, I found deep and sympathetic concern with our British difficulties. You were right in thinking we'd "shot the works"—that's at the bottom of most of our present trouble. We bled ourselves white in this war and emerged far weaker than we realized till recently.

For an example of a vicious circle, consider timber. We need coal at home and to re-start our European friends. To get it we must house miners and have plenty of pit-props. These things come mostly from Sweden, particularly since two wars have nearly exhausted our supplies of home-grown timber. Sweden is willing to export timber against coal, but we've no export surplus till we've reconditioned the mines and housed the workers. So, Sweden burns timber we need and our coal stays underground.

Again, there's mechanization of the mines. Before the war, British coal mining was 70% mechanized, but many of our seams don't lend themselves to machine-mining, being too steep or too narrow. Actually, we've got a new type of tool in production which can cut, gather and load in fairly narrow seams in one operation, and we're hoping this may prove the answer to some of our production

problems. Meanwhile, it must be appreciated that while we had our hands full with Hitler we let development and maintenance go to pot. You can't suddenly wish new shafts and travelling ways into being at the best of times, and with our present experiment in socialism trying to find its feet amid appalling shortages and bottlenecks—well, progress is painfully slow.

That raises the question of management-labor relations. It's early to judge the effect of nationalization of the mines, though I think the red light's showing. Under the present set-up, management can no longer control by hiring and firing, and nothing has been found to take over the problem of discipline. Government, in theory broadly based on the people, listens too partially to sectionally organized trade-unionism. Now, union leaders rose to power because they did one thing well—stirred up trouble with the owners and then got better pay for their followers. Today the picture has completely changed. The union leaders have political power and somehow they must prevent their followers from striking or slacking—a reversal of what in the past they've striven to do. And all the time the food position gets worse and the cost of living creeps up—two strong fomenters of discontent in the ranks.

Yes, the leaders of the Labor Party are in a spot—but just think what might be happening if they were kibitzing from the sidelines while traditional Conservatism tried to dig our economy out of the war ruins. We'd be riven from end to end of the country with faction and major strikes, instead of owing much of our difficulty to trying to go too far and too fast on damaged engines. You could, in quite a realistic way, look on what is happening here as analogous to the job of starting up on a brand-new flowsheet. The feed to the mill is the determination of a population of 48 millions on a small, bomb-happy island. The product we're trying to make is a better world for ourselves and for the vast mixture of creeds and races that looks toward us at the heart of the British Commonwealth. Two disastrous wars have convinced us that there was something wrong with the old lay-out. Booms and slumps have shown themselves to be economic surges which play the devil with industry and human happiness and which we must learn to control. There wasn't time to try things out on pilot-plant scale—we were forced to hook up whatever could be made to run with the consent of the people, and to shoot trouble as it developed. That's where we are just now. Be patient with us—we'll get the darned thing straight in the end. You can call the British a lot of hard names and hit some sort of a target accurately, but we're out to show that nobody can call us quitters and later on be found historically accurate.

London, England E. J. PRYOR

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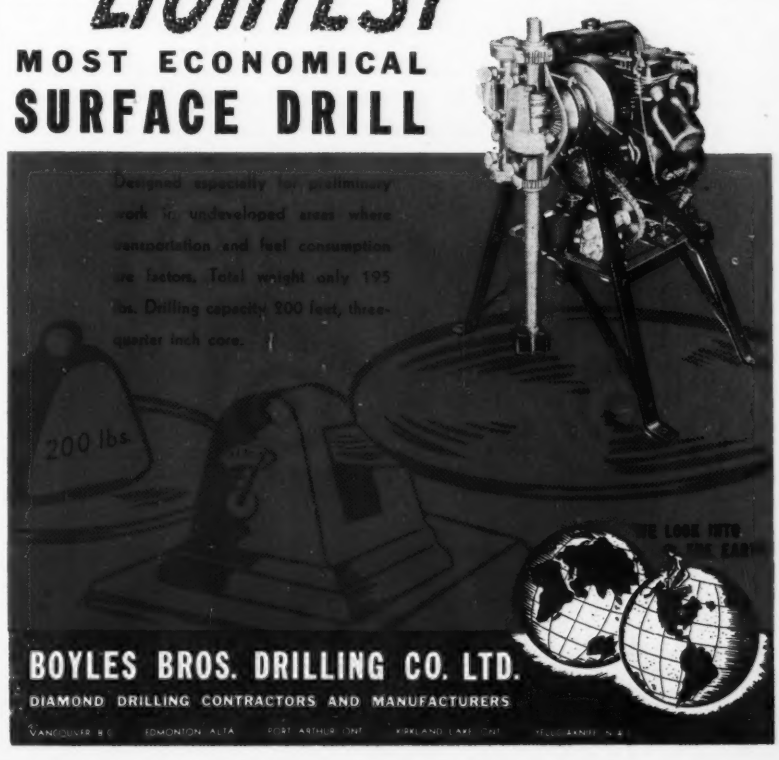

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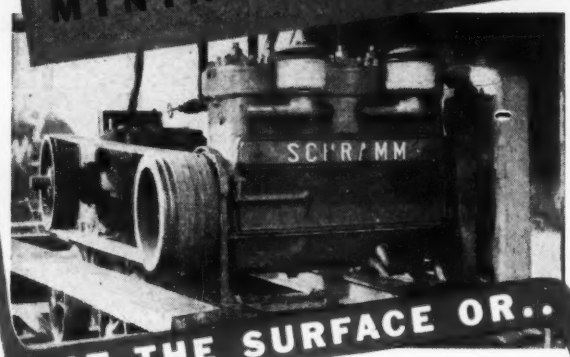

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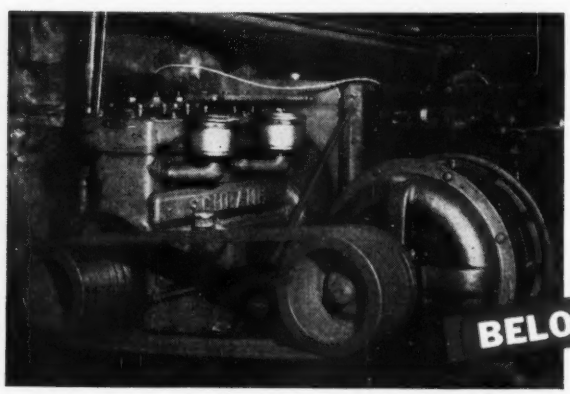
Mining Engineers want ruggedness and dependability in an air compressor, portable or stationary . . . at the surface or down in the shaft. That's exactly what Schramm provides . . . plus four special features built into every Schramm Air Compressor: 1. 100% Watercooled, 2. Compact—Lightweight, 3. Mechanical intake valve, and 4. Forced feed lubrication.



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Books *(Continued from p. 106)*

PERMAFROST. Compiled by Simeon W. Miller. Published by J. W. Edwards, Inc., Ann Arbor, Mich. Pp. 231. Price $3.00.

Perpetually frozen ground is a phenomenon most familiar to the Russians, half of whose territory is covered by permafrost ranging up to a maximum of 400 meters in thickness. It also occurs over most of Alaska and portions of northern Canada. This manual, a reprinting and expansion of material published in 1943 and 1945 by the Military Intelligence Division of the U. S. Army, deals lucidly and systematically with engineering problems related to permanently frozen ground, such as building, bridge, road, dam and runway construction and water supply. The somewhat baffling terminology is explained in an extensive glossary. The well-organized text is liberally illustrated with graphs, diagrams and photographs. It is obvious that the study of permafrost behavior materially aided by the work of Russian researchists, has progressed to the point of becoming a fairly exact science. It is also apparent that the defense of our northern frontiers prompted military sponsorship of the exhaustive investigations represented in this book. The findings have value for mine and dredge operators in the far north and conceivably will some day facilitate mining operations not yet envisaged in the interior of Alaska.

TRANSACTIONS OF THE CANADIAN INSTITUTE OF MINING AND METALLURGY AND OF THE THE MINING SOCIETY OF NOVA SCOTIA. Vol. XLIX, 1946. Published at the secretary's office, 906 Drummond Bldg., Montreal, Quebec. Pp. 669.

Edited by the secretary, this volume is a compilation of papers published during 1946 in the monthly bulletin of the Canadian Institute, together with contributed discussion. The very wide range of subjects covered reflects the keen interest taken by members of the Canadian Institute in progressive technology. As a reference source on modern mining and metallurgy the volume is indispensable.

THE MINERAL KEY. By Howard B. Graves, Jr., Chemist, Research Division, International Minerals and Chemical Corporation. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Pp. 178. Price, $4.00.

Helpful tables and methods to use in identifying 823 minerals are provided in this pocket-size book for amateur mineralogists and mineral collectors. The use of the tables is explained, and tests are described which involve only the use of inexpensive chemicals, simple apparatus.

XUM

REGIONAL NEWS

NEW YORK

Activities of Adirondack iron ore properties are reported

★Jones and Laughlin Ore Co.'s Benson Mines operations, near Star Lake, N. Y., are producing at the rate of about 6,000 tons per day of magnetite iron ore carrying about 24% iron. This is concentrated on a 3 to 1 ratio by wet magnetic separation methods and then sintered.

All ore production is from open-pit mining. The present Benson pit is about 1,200 ft. long and the orebody is known to extend another 1,000 ft. or so westerly. At the east end of the pit the orebody takes a sharp turn to the north, extending for 1½ miles in this direction. Maximum width of the mineralized zone is more than 1,200 ft., including bands of martite and material below present economic grade. In the Benson pit the total mining width is 400 ft., of which about 120 ft., adjacent to the hanging wall north, represents the best ore. This pit is now down about 75 ft., and is to go down another 120 ft.

Benches average 50 to 60 ft. high and are drilled with Bucyrus Erie No. 42T churn drills putting down 9-in. holes. Marion all-electric 5 cu. yd. shovels load into Walter tractor-trailer diesel-powered trucks carrying 25 to 30 tons to the load. The haul from the Benson pit to the crushing plant averages 600 ft. and from the Newton Falls pit, on the northern extension of the orebody, about 8,400 ft.

All ground is held under fee lease. Two-thirds of present production comes from the Benson pit, one-third from the Newton Falls pit. Concentrate output is now at the rate of about 65,000 tons a month. Total open-pit reserves are estimated to be in excess of 30 million tons of finished concentrate.

Bands of non-magnetic iron ore occurring along the foot-wall of the Benson pit and the hanging-wall of the Newton Falls pit present a problem in concentration. The maximum proportion of non-magnetic iron in the ore now being mined is 4%. A pilot plant has been operated for some time trying out various wet treatment processes for concentrating the non-magnetic ores.

A car-thawing plant with capacity for twelve railroad cars has recently been completed. This will facilitate winter unloading of shipments of powdered anthracite which is used for the sintering mix. A new garage is also being built to replace the present restricted truck-servicing facilities.

Jesse C. Madson is general superintendent at Benson Mines; R. W. Brand is assistant general superintendent; and R. G. Fleck is plant superintendent.

★At Lyon Mountain, Republic Steel Corporation's Chateaugay District operations, under W. J. Linney, general superintendent, are producing at the rate of 100,000 tons a month of 22 to 25% low-phosphorus magnetite ore. The 63-deg. inclined shaft reaches to a depth of 2,350 ft. Mining is done by shrinkage, sub-level underhand, and scraper stoping methods according to varying types of ore occurrence. An underground jaw crusher, 48 in. by 36 in., located at the bottom of the main ore pass, reduces the ore to minus 8 in. size before hoisting in 8-ton skips. A wet magnetic concentrating plant produces a 68% concentrate which is then sintered. Surface diamond drilling is being done this summer to investigate other known magnetic orebodies.

★Approximately 6,000 tons of ilmenite-magnetite ore per 24 hours is being mined by open-cut methods from the National Lead Company's MacIntyre Development at Tahawus, which continues to be a principal domestic source of titanium ores. After crushing, sizing and magnetic cobbing, about 4,500 tons a day is sent to the concentrator. Concentrate output averages 750 tons a day of ilmenite product running 45% TiO_2 and up to 1,800 tons daily of magnetite concentrate, carrying 57% iron, which is put through a sintering plant.

The open pit measures some 2,000 ft. long by about 750 ft. wide. At present some 300,000 cu. yd. of stripping is being carried out on the footwall side of the orebody under contract by Winston Bros., with the work about half completed. Ore is drilled by five company-owned Bucyrus-Erie Model 29-T churn drills. Nine-inch holes are put down on 16 ft. centers, with an average burden of 18 ft., to a depth of 38 ft. Benches are 35 ft. high. The average blast breaks 1,200 to 1,400 tons per hole. The ore is power-shoveled into 15-ton trucks.

Recent diamond drilling has disclosed ore to a depth of over 600 ft. below the level of the lake which lies on the hanging-wall side of the orebody. This is the deepest ore drilled to date.

To relieve a shortage of housing at the property, the company is financing the construction of several apartment dwellings which will provide a total of twenty-six one-family units.

Employment totals around 420 men in addition to contractors' crews engaged in stripping and construction work. Gloyd M. Wiles, is manager, F. R. Milliken, assistant manager; C. R. Begor, Sr., mine superintendent; J. J. Strohl, mill superintendent; J. C. Mead, sintering plant superintendent and C. R. Begor, Jr., superintendent of maintenance.

MICHIGAN

Copper mines can continue to produce if price stays up

★Removal of the copper subsidy, following the annulment of the copper tariff, injects the element of uncertainty in the mining industry in the Michigan copper district. Mining now is on a month-to-month basis. As long as the market price stays up to 21½c per pound, the mines can continue to operate, provided that costs do not increase. Any pronounced drop in price or greater costs would create a serious situation.

Calumet & Hecla is now employing 2,300 men. Only 1,400 were on the payroll before the war. Calumet & Hecla could hold out longer than Isle Royale if the market price of copper dropped appreciably inasmuch as it has a secondary copper and chemical business in this district. But some or all of its operating mine units would be seriously affected. Isle Royale, which is barely breaking even on the present price, is in a more precarious condition. Isle Royale, which employs 350 men, resumed mining in 1938 after a considerable period of idleness. Pumping out of the mine and repairs were started in 1937, all at a big expense. If the mine is again forced to close, it is doubtful whether it would ever pay to reopen it.

Copper Range has practically ceased to be a producer, although it is cleaning out its No. 4 Champion shaft and sending copper rock already broken to the mill. Only a small force is employed and production is small. Copper Range suspended mining operations two years ago when negotiations with the CIO failed and the company felt it could no longer continue mining.

★At Calumet & Hecla's Centennial branch, the 23rd level plat in No. 2 shaft on the Kearsarge lode has been reconditioned preparatory to drifting south from the present end of the

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The average price of steel as obtained by the mills is a little over 3¢ per pound — (based on weighted production of 9 major steel items, representing a substantial percentage of steel production in the United States). Including the last increases, steel has advanced only about ½¢ per pound over the last ten years.

Steel items like nails and grinding media are higher per pound than the composite price of steel. Even so, today's prices add but little to the cost of building a house or grinding a ton of ore.

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Michigan *(Continued)*

drift which is about 400 ft. from the shaft. The drift is considered an exploratory opening for the purpose of testing the Kearsarge lode area between Centennial No. 2 shaft and No. 19 shaft of Calumet & Hecla.

At the North Kearsarge branch, No. 4 shaft is being sunk below that 32nd level and the shaft will be extended to the 38th level north of No. 1 shaft. The area between these two levels will be developed from No. 4 shaft.

IRON COUNTRY

Iron ore shipments from Lake Superior region are summarized—Consumption for year estimated

★But for the late start of the shipping season, the tonnage of iron ore brought down from the Lake Superior ranges to the lower lake ports to date would have been larger than it is. Practically all of April was lost due to the heavy ice condition then in the upper lakes areas. Another factor is the number of lake ships that have been taken out of service and scrapped. No shortage of ore exists at the head of the lakes.

Mid-August is generally regarded as the half-way point for lake ore shipments, in contrast to the coal trade where July 4 is considered the middle of the season. On Aug. 25 a total of 48,396,000 tons of ore had been brought down the lakes as compared to 31,695,000 tons for the corresponding 1946 period. Total shipments brought down by lake in 1946 were 59,137,000 tons.

Aug. 1 stocks of ore in plant yards and shippers' bins totaled 28,440,000 tons. The carry-over of ore on May 1 was 13,500,000 tons or about two-months' supply at the rate of consumption at the time.

The 32 million tons estimated to come down the lakes between Aug. 25 and the close of shipping would mean 69 million tons in stock except for the fact that the furnaces will have used 32,500,000 tons, conservatively estimating 6½ million tons per month, between Aug. 1 and Jan. 1, leaving 36,500,000 tons in bins and yards next Jan. 1. (Prior to 1940 a carry-over of 20 million tons was common practice when the industry used 40 million tons per year).

The stockpile of 28,440,000 tons reported as of Aug. 1 is at least a half million tons in excess of what would have been on hand had all furnaces reported in blast been actually operating. A shortage of coke developed soon after July 1, due to the miners' vacation and work stoppage. Some of the larger steel companies, instead of cooling off and completely closing down furnaces during July

kept them hot. Though not producing pig, they were still reported in blast.

Ore consumption, historically higher in the winter months, is expected to run slightly over 7 million tons per month this winter. During war years a rate of 7.5 million tons was attained.

This winter's heavy consumption will be due partly to the scrap shortage, also to the use of techniques on some blast furnaces which give them greater capacity. Should consumption in the first four months of 1948 be at the rate of seven million tons and 1947 shipments total but 80 million tons, the carryover on May 1 next would be a very uncomfortable 8 to 9 millions tons, lowest in recent years and dangerous to many steel makers because it would not be evenly divided as to grade nor evenly distributed among companies.

As with ore shipments, ice in the upper lake regions held up early movement of coal by lake carriers. Early predictions of a 55 to 60 million net tons going to the upper ports have been revised downward and shipments of coal this year are expected to pass last year's 49,500,000 tons by no more than 500,000 tons.

The forecasts made are based on the assumption of normal weather conditions in the upper lake regions in late October and November.

★The Minnesota high court ruled recently that the State owns the metal under Syracuse Lake. This decision ends the litigation pending for many years as to the ownership of the iron ore under Syracuse Lake which was claimed by the Longyear Holding Co., and 40 other property owners. Attorney General J. A. A. Burnquist stated that millions of tons of ores under other lakebeds also are affected by the decision. The State based its claim on the theory that the waters are of a navigable nature and consequently are the property of the commonwealth. The lake was drained in 1944 and recovery of the ore was begun. Diversion of waters was required to reach the orebody. The property is called the Embarrass mine and is being operated by the Lake Mining Co.

★The Oliver Iron Mining Co., has recently started operation of its conveyor belt serving the Hull-Nelson iron ore property located at Eveleth, Minn. The system is about 1,500 ft. long and runs underground for most of the way, discharging on surface into a pocket and thence into railroad cars.

★To dewater the Bengal and Tulley mines on the Menominee range near Iron River, Mich., the M. A. Hanna Co. installed two pumps on a raft in the adjoining flooded Caspian mine pit and these are discharging 10,000 g. p. m. and lowering the water about 2 ft. per day. As soon as the pit is emptied, a deep-well pump will be installed at the old Bengal shaft to complete the work so that the com-

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Iron Country *(Continued)*

pany can explore for ore in both mines. Although the Hanna company has held the lease on the Tulley property since it ceased operations many years ago, it did not take over Bengal mine until 1944 when Pickands, Mather & Co., who formerly operated it, ceased operations and surrendered the lease.

*Shipments of iron ore to Lower Lake Ports in August were 12,122,244 long tons, bringing the total for the season up to Sept. 1 to 49,977,612 tons, according to Lake Superior Iron Ore Association.

ALABAMA

★G. R. Armstrong resigned some time ago as chief engineer of Sloss-Sheffield to devote his time to active charge of operations as vice-president of Etowah Coal & Iron Company at Gadsden, and as vice-president of Coosa Coal Company at Wattsville. The Japanese Government during World War I operated the iron deposit at Gadsden and the coal mine at Wattsville. Both strip and underground mining is being done at Wattsville. Leonard Hammett is in charge of the Coosa mine.

All of the surface equipment has been installed and made ready for functioning at the Gadsden iron mine including the picking belt, crusher and loading devices. Underground activities have progressed where active mining operations are to get under way. The main stope has been extended 250 ft. and the company has turned the third North and third South left and has raised the loading pocket. It is planned to start stoping in the third North in the near future. Tests have shown that the deposit is highest grade red ore in the state. While the plant has an estimated capacity of 500 tons per day production in excess of this can be accomplished with present facilities.

ILLINOIS and KENTUCKY

Alco corporation starts new mill—Inland Steel Co. leases 5,000 acres in Kentucky

★The Alco Lead Corporation started operation of a new flotation mill at its Hardin County, Ill., property early in August. The mill has 100-ton capacity and was designed to recover slimes from former operations. While operation is not yet at full capacity, recovery is very high, according to Kenneth Ingle, Alco president. Lead oxide ore from the company's Old Patrick mine, the only mine in the Kentucky-Illinois district producing lead excusively, is being milled at the new plant.

★Inland Steel Co., fluorspar division of Rosiclare, Ill., has leased 5,000 acres in Crittenden and Livingston counties, Kentucky, and started an extensive exploration program. At present drilling is under way on the Barnes tract.

★Incorporation of the Hicks Creek Fluorspar Mining Co. has been completed. The incorporators are Clyde L. Flynn, Jr., Wiley Cochran, Lloyd Jennings, and Ted Joiner, all of Elizabethtown, Ill., and Scerial Thompson, of Harrisburg, Ill. Officers elected were Lloyd Jennings, president; Wiley Cochran, vice president; and Clyde Flynn, Jr., secretary-treasurer. A shaft has been sunk at the company's property in Pope County, Ill.

NORTH CAROLINA

★Tungsten Mining Corporation has embarked on an extensive plan of development of their properties in Vance County, N. C. James I. Moore, Jr., general sperintendent, says that two winzes will be sunk an additional 200 ft. each, and a new shaft on the corporation's Sneed property will be sunk 250 ft. Prospecting and development of other promising areas will be a part of the program. Increase in milling capacity above the present 200 tons per day is also contemplated. Additional houses for employees are now being built. A new laboratory is almost completed and a modern office building is being started.

TRI-STATE

Allen bill veto cuts Tri-State production—Eagle-Picher raises concentrate price for zinc

★Approximately half of the five to six thousand men employed in the mining field have been thrown out of work, and the production average of 5,350 tons of zinc concentrates weekly for the first half of 1947 has been reduced about 60% following the presidential veto of the Allen Bill. Less than one-half of the mine mills of the district were running by the end of August, and only one of a dozen tailing plants continued in operation. By the end of August it also was generally recognized that a major portion of operations in the Tri-State could not produce at the prevailing open market price for blende because of highly inflated costs and the marginal character of the ore. The operator was caught between a "squeeze," with the price of his principal product literally cut in two; sup-

plies going even higher, such as steel, and no hope for wage cuts because of high living costs.

★On Monday, September 1, the price of zinc concentrates at the Eagle-Picher Central mill was increased $8 a ton over the open market blende quotation of $64 a ton. The new $72-a-ton price, which is the highest base price in a 30-year period, is paid on ores that are treated in the Central mill only. The higher price was established not only to assist the small, independent, marginal ore producer to continue operations, but also to encourage the movement of a greater tonnage to the big mill to maintain its concentration efficiency. Other district producers are awaiting to see what other smelters will offer in the open market, with price as the principal factor in determining the extent of operations and production in the immediate future.

COLORADO

Shenandoah Dives wins safety award —A. S. & R. to sink shaft on Triumph Gold property

★Charles A. Chase, general manager, Shenandoah Dives Mining Co., received a bronze safety plaque, presented by the Colorado Mining Association and the Colorado Industrial Commission. The plaque is engraved as follows: "Colorado Mining Association, Colorado Industrial Commission, Safety Award, First Prize, Large Operator, 1946." The award means that there have been fewer industrial accidents at the Shenandoah Dives property in 1946 than in any other similar operation in the state.

★At present, all lessee ore bins at the Cresson mine at Cripple Creek are full, and all but two of the 23 sets of lessees in the mine are reported shipping ore to the Golden Cycle mill in Colorado Springs, according to a statement made by Wesley Moulton, superintendent.

★A mining strike in the St. Elmo district has been reported by Tom Jefferson and Earl Eaton of Salida. They have staked out four claims adjoining the Mary Murphy mine and have uncovered a vein which runs 0.02 oz. gold, 3.8 oz. silver, 16.3% lead and 21.4% zinc. Jefferson says the Resurrection mill management at Leadville has sampled the ore and has offered $47.16 a ton.

★After a brief shutdown due to the dissolution of partnership, work again is under way at the Forest Queen mine at Irwin in Gunnison county. According to A. D. Hahn, manager of the operation, the newly formed Forest Queen, Inc., is the operating company. Hahn was in Denver recently completing arrangements for mine and mill machinery. A new all-steel mill building is under construction and is expected to be treating ore in September.

★The Jeff Davis mine, in the Cripple Creek district, is being opened by Miller Hasselbach & Co. of Omaha, Neb. Clarence Peterson, local representative of the company, announced that surface work had been practically completed. Shaft work must be completed before underground operations can start.

★The American Smelting & Refining Co. at Leadville has secured a lease on the ore below 700 ft. depth of Triumph Gold, Inc. and will, it is reported, spend $750,000 sinking a 2,500-ft. four-compartment shaft to mine ore that has already been proved by diamond drilling from two adjacent shafts. Miners are now driving a tunnel from one of the shafts from which the diamond drilling was done. This is at depth of over 1,000 ft. and the tunnel is in 600 ft. of the 1,000 ft. to be driven. The 1,000-ft. point in the tunnel will be directly under the point where the new 2,500-ft. vertical shaft will cut through. The latter will serve for ventilation purposes.

UTAH

National Tunnel shuts down at Bingham—Utah Mining Association meets in Salt Lake City

★Discontinuance of federal premium payments coupled with impending higher labor costs resulted in the shutdown of National Tunnel & Mines Co., Bingham, with 200 employees, during August. Frank A. Wardlaw, Jr., general manager of International Smelting & Refining Co., made the announcement.

★Kennecott Copper Corp. plans to spend more than $43,000,000 in operating expenses in Utah in the next 12 months, D.D. Moffat, vice president, announced. Payrolls will total $13,000,000 reflecting wage increases. Other expenditures will include: Freight, smelting and refining costs, $18,000,000; supply purchases and miscellaneous, $8,000,000, and state, county and other local taxes, more than $3,000,000. In addition, several millions of dollars will be spent for new equipment and facilities in Utah mine and mill operations. The company anticipates a good demand for copper and many years of activity and progress, says a letter mailed to employees. The payroll for the first half of August was the largest in history for that period, with 4,398 employees in Utah.

★Kennecott's first aid team won first place in the Utah-Nevada Safety Society's contest in Salt Lake City Sept. 5.

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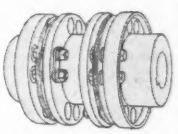

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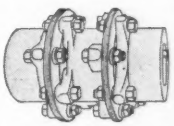

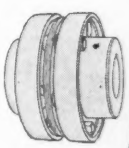

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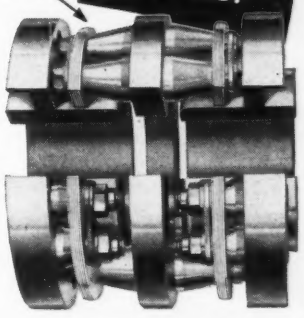

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Utah (*Continued*)

★Silver King Coalition Mines Co., Park City, made a net profit of $102,560 for the quarter ended June 30 after all taxes and depreciation but before depletion, equal to 8.4c per share on 1,220,467 shares of $5 par value common stock outstanding.

★Utah Mining Assn. members, meeting Sept. 3 in Salt Lake City, voiced approvement of the interim appointment of Dr. James Boyd as Director of the U. S. Bureau of Mines. Meeting with Secy. of Interior J. A. Krug and Dr. Boyd, the operators expressed antagonism toward proposed central agencies in various localities where location notices and patented claims could be filed and mapped. Secy. Krug said if the industry itself is lukewarm on such a decentralization program he would not push it.

Both Secy. Krug and Dr. Boyd assured the operators that the government does not want to harm the domestic industry by importing foreign copper, lead and zinc. Relative to stockpiling, Secy. Krug reiterated the President's expressed determination not to harm the nation's industry. When conferees indicated they could not sell to the stockpile at below-market prices, Mr. Krug said he would have Dr. Boyd study the issue with a view to offering a remedy.

Dr. Boyd said he hoped to establish industrial committees on a working basis—to act between industry, executive government and congress—in an effort to conserve mineral deposits, locate and develop new deposits and insure mineral self-sufficiency for security measures. The director said mining can be made as safe as any other industry "but everyone who works in a mine must be keyed to a rigid safety program."

ARIZONA

Perlite plant starts operations—Small properties are preparing to mine and ship ore

★The Western Perlite Corporation, Phoenix, recently started operations at their popping plant. Officials disclose that approximately 30 tons of finished perlite material can be handled daily at the plant. Raw material for the plant will be obtained from a group of three claims near Superior and 32 claims near Aguila.

★The Hilltop mine in the Chiricahua Mountains of Cochise County, has been taken over by A. J. Vandergrift. During recent months the mine has been operated by Ralph Morrow. The new operators plan to equip the mine and start operations on the Blacksmith tunnel orebody.

★G. C. Harwood of Phoenix has purchased the Sein Fein group of claims in Aravaipa and expects to start operations soon. Values in the ore are lead and zinc, and some silver and gold.

★Twenty acres of placer ground near Wickenburg have been contracted to purchase by H. B. Thayer of New Mexico. The property is known as the Brown Camp and Thayer plans to start operations soon.

★The Golden Crown Mining Co. of Crown King, Arizona is dewatering the Burro mine and plans to prepare it for production.

★Gold-copper ore has been discovered at the old Desert mine operated by James A. Troy. The discovery was made at the surface in a three-foot vein, and further exploration work is being done with a small compressor and tugger hoist. A shipment of high grade ore is expected soon.

★The Bluebird mine, Pinal County, is being reopened and ready to ship concentrates. The Bluebird has been developed on seven levels with approximately 1,000 ft. of development on each. A crew of 22 men is employed in opening the lower levels.

★The Cedar Talisman Consolidated Mines Co., has completed construction of its 70-ton flotation plant, and is now making shipments of zinc concentrates to Amarillo, and copper and gold shipments to El Paso from its French Lily mine.

★Attorneys for the trustees have asked the Federal Court to liquidate the Davenport Mining and Reduction Co. of Kingman, Arizona, thereby dismissing reorganization plans, dormant for four years. When the company's assets were filed in 1942, its lead, copper and zinc claims were valued at more than $200,000 and development work at approximately $30,000.

★The Copper Prince mine at El Cobre, forty-one miles west of Sasabe, Arizona, is being reopened by J. H. Oates of Nogales, Ariz. He is employing twenty-five men to retimber the shaft preparatory to dewatering. The mine has been idle since 1933.

★A rock slide in the Cambell shaft of the Phelps Dodge Corporation in Bisbee recently caused the death of Frank Griffith, a miner working on the 1,700-ft. level.

★The Orizaba mine, in the New River district of Maricopa County, has been leased from RFC by C. D. Brock. The mine is reported to have about 10,000 tons of gold-silver ore blocked out and available for mining.

★The new 100-ton flotation mill of Operations Incorporated, at Tombstone, began activities in August. Two shifts are now employed and mine production has been stepped up to meet the demand for ore. An investment of $300,000 was made in the

project. The company is operating the San Juan mine in the Dragoon Mountains, owned by Jonathan Gordon. Construction work on the mill started last spring.

★In anticipation of the closing of Fort Huanchuca Sept. 15, prospectors have been active in the far corners of the reservation. To stop this practise, patrols have been established and all prospectors and claim jumpers will be prosecuted under Federal statutes, Capt. Frank A. Wilson, in charge, said.

★The demand for copper miners in the Globe-Miami area continues despite the housing shortage. About one third of the job seekers in this area are migrants. Construction of permanent housing lags.

★Copper mines of Globe distributed $100,000 Sept. 5 in retroactive pay increases agreed upon in recent negotiations concerning new working contracts. The increases were effective as of April 1.

★W. S. Sampson, of Dos Cabazes recently filed a lode claim mining location in the California mining district. The mine has been named Pine Zinc No. 1 and is situated two miles southeast of the U. S. beacon light plant and the old slag dump.

★The mineral exhibit at Arizona's State Fair, Nov. 7 to 16, inclusive, is expected to be the largest yet presented. Prominent among the prizes offered is a copper plaque to be presented by the Phelps Dodge Corporation to the grade school winning first prize. The name of the winning school will be engraved on the plaque, which will remain in the possession of the winner until the next Fair, when it will be placed on exhibition again for further competition. Limited space and unusually large entries preclude the extension of invitations to collectors outside of Arizona although material exhibited need not be all Arizona specimens. A. L. Flagg will be in charge of the mineral exhibit.

NEVADA

Calumet & Hecla drilling in Tonopah district—Rio Tinto copper mine and mill down

★The deep drilling under way with Longyear equipment at the north end of the Tonopah district is being conducted by Calumet & Hecla Cons. Copper Co. This has been revealed by Calumet's Nevada agent, M. A. Diskin. On the new drilling project at Tonopah, the first hole has been completed to 1,500 ft., the second is nearing 900 ft.

★Anaconda Copper has decided to close its Rio Tinto copper mine and 450-ton flotation mill at Rio Tinto, in

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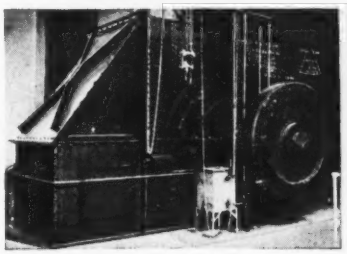

Semi-tropical rainfall combined with naturally soft material encountered in quarrying operations was seriously curtailing production in the plant of a well known cement manufacturer*. It was not until a Dixie Non-Clog Hammermill was put to work here that delays due to "choke ups" were reduced and a new high in production was established. Operating at times for a whole week on raw material which was "nothing but a mass of plastic, sticky water-sodden mud"... this Dixie Hammermill has been instrumental in keeping production at a high peak... yet at low cost. *name on request

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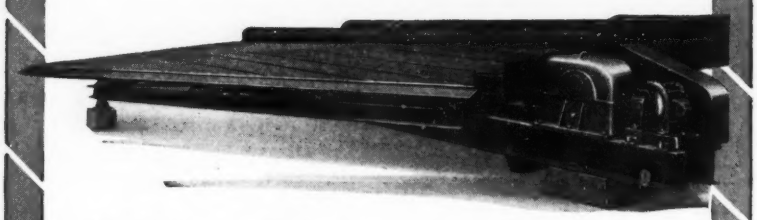

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Nevada *(Continued)*

northern Elko County. Failure to find new ore is given as the reason. Owners of property along the copper belt of the district appear little perturbed. Substantial financing seems to be available for geophysical surveys.

★Copper Canyon Mining Co., hit by termination of premium payments for copper, has laid off some men. Immediate effort will be directed to sinking the main Julie shaft to open the zinc-lead-silver orebody found by deep drilling.

★Kennecott Copper Corporation is said to have leased claims near Eureka, in the Prospect Mountain area south of the Richmond-Eureka group of mines.

★Standard Cyaniding Co., currently the largest gold operation in Nevada, has been treating 650 tons per day of open-cut ore that yields $1.30 per ton. Other orebodies are being stripped. H. L. Hazen, president and manager, reports difficulty from water shortage. Some dump ore from the old Rye Patch mine has also been treated.

★Cordero Mining Co., largest producer of mercury in Nevada in recent years, recently closed down for a fortnight while repairs were made on its 80-ton furnace plant. Output recently was at the rate of 15 flasks per day. William Matheson is superintendent.

NEW MEXICO

Major mining companies in State sign new labor contracts

★The Zuni Milling Company, subsidiary of the Shattuck Denn Mining Corporation, is operating two fluorspar mines in the Zuni Mountains some 22 miles south of Grants in Valencia County and a mill 18 miles south of Albuquerque at Los Lunas. Little ore is being mined at present at the two mines of the company, but extensive development work is being carried on underground. Two main ore deposits furnished large quantities of fluorspar during the war and have been explored and developed for a distance of over 4000 ft. each on the surface with vertical depths of ore being determined at about 700 ft. in one mine, and 500 ft. in the other. At present practically all of the ore handled at the mill at Los Lunas is custom ore from small producers in the State as well as some from Old Mexico. Both acid and ceramic grade products are made at the mill. George Warner is general superintendent of the operations with offices in the Korber Building of Albuquerque.

★The Chino Mines Division of the Kennecott Copper Corporation, operating at Santa Rita and Hurley, Grant

County, on August 12, concluded a new wage contract with the CIO Union of the International Mine, Mill and Smelter Workers, retroactive to June 16th.

Overall wage increases under the new contract is 16c an hour affecting all employees of the union, including 25 job reclassifications, six paid holidays and other benefits. Included in the contract was "protection of the union workers from the Taft-Hartley Law by modification of the no-strike provision".

Signing of new wage agreements with the CIO retroactive to July was announced by the American Smelting & Refining Co. operating the Ground Hog Unit at Vanadium, and the U. S. Smelting, Refining and Mining Co. at Bayard.

Among other companies of the Grant County district to sign agreements with the labor unions in August were the Peru Mining Co., Empire Zinc Co., Black Hawk Consolidated Mines Co., and the Phelps Dodge Corporation. Approximately 3,000 men are employed in the mines and mine-plants of the district.

★The mill of the "Snyder's Lucky Four" fluorspar mining and milling company, at Grants, was completely demolished by fire of unknown origin on August 21. The mill, belonging to A. H. Snyder and associates of Denver, has not been in operation for some time.

★With the contracts between labor and management of the three operating potash mines near Carlsbad satisfactorily worked out and ready to sign, a new local dispute arose at the plant of the International Mineral and Chemical Corporation and a two-day strike followed. In objection to the place of assembly and dispersal of time cards, 19 men of the surface plant did not properly handle their time cards and check out of the plant at shift's end according to regulations on Aug. 19. These men were barred from the premises the following day, the union ruled it a "lockout" and all members of the union at that mine and plant struck for two days until the dispute was settled on Aug. 21.

CALIFORNIA

Rich discovery reported at Gold Hill property—Anaconda takes over Inyo County properties

★The reported discovery of rich gold ore in the Quartz Hill mine near Scott Bar, Siskiyou County, has been confirmed in San Francisco by Harry Thompson, who operates the property under lease from George Noonan, owner. The ore was found below the Holmes fault, and is said to carry considerable tellurides in addition to

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California (*Continued*)

heavy free gold. Test work in a 10-ton pilot mill is planned. The Quartz Hill property was discovered in the early 50's, and has been operated almost continuously ever since by open pit and hydraulic mining methods.

★It is reported that Anaconda Copper Mining Co., operator of the Darwin Mines lead property at Darwin, Inyo County, has taken over the Columbia No. 2 mine and the Noonday and Gunsite properties in the Resting Springs district of Inyo County, near Tecopa. The mines have been operated for several years by the Shoshone Division of Finlay Co., headed by Mark Finlay, of Los Angeles.

★Development work is in progress at the Pennsylvania mine in Browns Valley, Yuba County, owned by Empire Star Mines Company, Ltd. Ellsworth Bennett is in charge of operations, and 12 men are employed. At Grass Valley, Nevada County, site of the company's North Star, Empire, and Pennsylvania operations, the mill has been opened to custom gold ore and concentrates.

★American Silver Corporation has started work on the first 100-ton section of a projected 300-ton flotation mill at Panamint City, Inyo County, where exploration and development of extensive silver properties are in progress. Erection of the mill and 4,000 ft. of tunneling have been contracted by the Bell Construction Corporation, which has been paid in advance with 500,000 of the company's 2,418,300 outstanding shares of common stock, a consideration valued at $150,000. Production is scheduled to start late this fall. Officers of the corporation include James Elliott, president and general manager; E. E. Whiteley, consulting engineer; and A. S. Geldman, resident engineer. The holdings consist of 60 claims covering 1,200 acres, and during the past year the company has expended some $500,000 in mine development, road construction, and purchase of mine and equipment.

★Construction of a mill is in progress at the Grit mine near Greenwood, El Dorado County, reopened some time ago by Liddicoat Gold Mines Co. The plant will have a capacity of from 50 to 90 tons of ore a day. About 11 men are employed under the direction of J. L. Liddicoat, general manager.

WASHINGTON

Mining resumed at Howe Sound's Chelan property. Metaline Mining & Leasing stops production

★Howe Sound Mining Co., which suspended production at its Chelan copper-zinc property last November, resumed mining in August, more than 60 men going back to work. Most of the 250-man crew had been kept on development during the shutdown. Last year, average production was 1,981 tons per operating day.

★Activities in the Metaline district include the exploration program of Sullivan Mining Co., Kellogg, Idaho, on its holdings southwest of Metaline Falls. Reports from the two holes, one nearly 1,000 ft. deep and the other deeper than 1,000 ft., are encouraging. Two more drills may be started. U. S. Smelting, Refining & Mining Co., which has claims on the west side of the Pend Oreille River, is reported to be investigating before undertaking an exploration program. Sunshine Mining Co. is also said to be interested in the area. Geologists were in the district in August investigating the possibility of mines being flooded if the proposed Boundary Dam should be built on the Pend Oreille River a mile south of the Canadian border, as suggested by Army engineers.

★Harbison Walker Co., owner of Northwest Magnesite Co., at Chewelah, earned $1.63 a share for the first six months of 1947, compared to 73c for the same period in 1946. A dividend of 50c a share was paid stockholders Sept. 2.

★Thomas R. R. Harris, secretary of Kettle River Gold Mining Co., has sued the company for $11,998 alleged due on funds advanced, a note, and for services rendered. He was awarded a default judgment by Judge R. E. Foley, at Spokane.

★Intervention by U. S. Attorney Harvey Erickson in the portal-to-portal suits brought by United Steelworkers of America, a CIO affiliate, means that the constitutionality of the law outlawing portal-to-portal pay will not be settled without hearing the Government's side of the case. Defendant firms include: American Zinc, Permanente Metals, Pend Oreille Mines & Metals, Metaline Mining & Leasing, and Howe Sound.

★Tungsten Mining & Milling Co. has been planning to start milling at the old Germania tungsten mine by early October, according to A. L. Ray. A wide vein is to be worked this fall. Drilling for a water supply is under way.

★Insufficiency of power is given by the War Assets Administration as the reason for not disposing of the Spokane magnesium plant. Grand Coulee power is being reserved for a sixth potline at Kaiser's Mead aluminum-reduction plant, and for the plant at Tacoma, recently leased by Kaiser, according to Representative Walt Horan, should either plant require more electricity. The power question is holding up decision as to the date for opening the latter plant.

★Kaiser Aluminum Co. finished a

shipment of 4,000 tons of aluminum pig to Buenos Aires late in August, the largest export order filled from Spokane.

★L. H. McGuire, U. S. Bureau of Mines' engineer at Seattle, told the Mining Bureau of the Chamber of Commerce recently that inert gases are being used in the Pacific Northwest to fight mine fires. They are passed over dry ice and sent back into the fire area. A fire in a Washington coal mine which had been fought for months was extinguished thus, he said in a few hours. Experiments are to be made with rock dust containing limestone for a smothering effect.

★Metaline Mining & Leasing Co., operated by American Zinc, which has been producing 150 tons of zinc-lead ore per day, has suspended production and is concentrating on development and exploring deeper levels. Last year's net profit amounted to $15,181.24.

★Although most of the properties affected by the plan recently announced for consolidating the Day mining interests are in the Coeur d'Alenes, at least one substantial group lies in the Republic district in Washington. The Aurum Mining Co. is included in the merger. Originally organized in 1927 to take over the mines department of the Northport Smelter and Refining Co., it has expanded the Day interests at Republic. It now holds 93 claims and lots aggregating more than 1,000 acres. Under a reorganization program in 1922, American Smelting obligated itself to pay $1 per dry ton for the lead product of the Hercules, Tamarack and Sherman mines. These returns go to the Aurum company, and on Jan. 1, 1946 this credit had aggregated $142,011.81. Production has been satisfactory. Aurum's reserves are practically as they were before the war interfered with active development.

★Roger O. Oscarson, new manager of Northwest Mining Association, told members early in August that sections of the proposed safety code for the mines of the State are not workable. He urged them to study the 114-page booklet to be ready with objections and suggestions for the public hearing.

★According to Day Karr, Regional Administrator of the SEC, at Seattle, arrangements have been made for owners of undeveloped claims to sell stock within five days after filing with the Commission, to encourage primary mine financing. Up to $300,000 may be raised. Small companies will not be required to make out prospectuses. E. V. Denney, of the Seattle office, is to be in Spokane each Monday to give aid in connection with SEC regulations but Spokane mining men feel this will not meet the industry's need. Mr. Denney will not have authority to pass on adequacy of filings.

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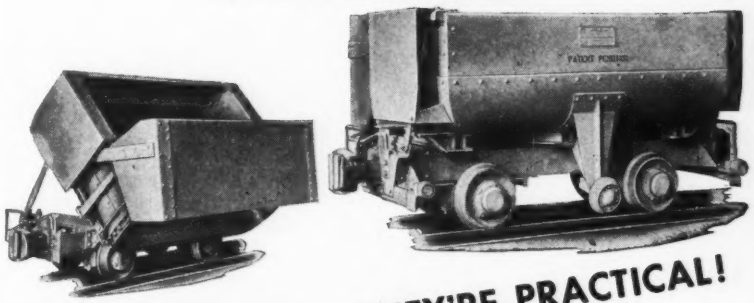

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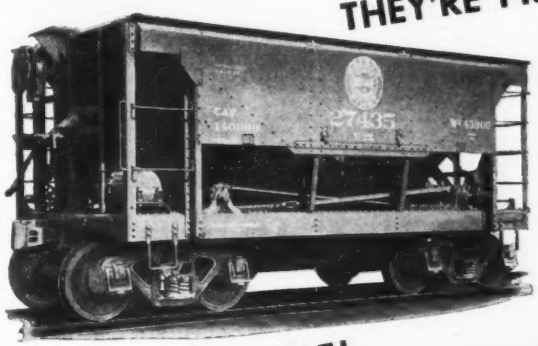

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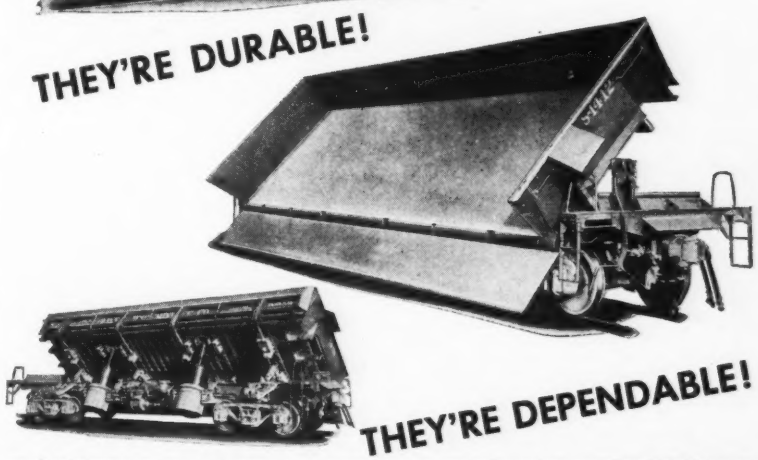

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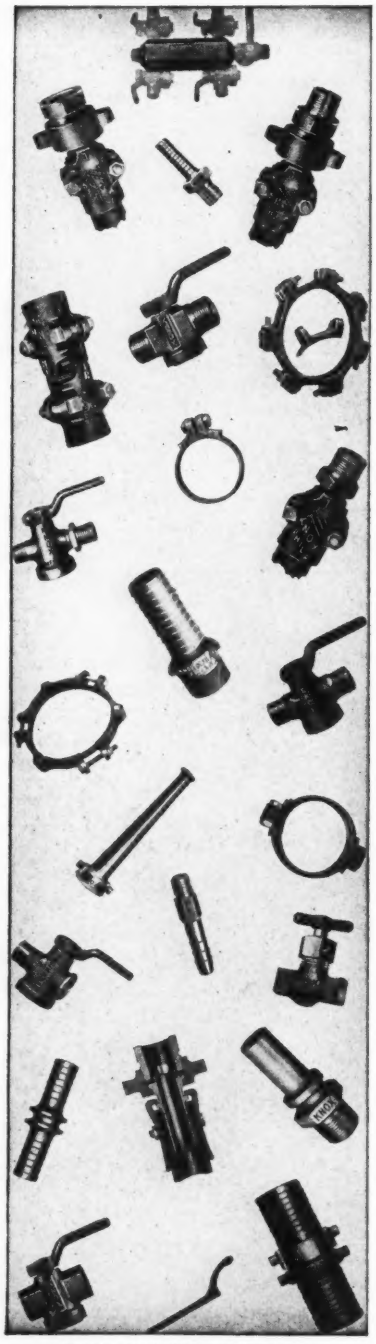

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MONTANA

North Butte operations suspended. Virginia City to have next Montana association meeting

★Restoration of the old camp of Bannock was the objective of the county civic associations in arranging a picnic on July 27. Speakers included John Collins, Dillon, president of Beaverhead County Mining Association, a chapter of the Mining Association of Montana; Julian W. Feiss, Washington, D. C., editor of the *Mining Congress Journal;* A. H. French, Dillon, and Carl J. Trauerman, Butte, secretary of the Mining Association of Montana.

★North Butte Mining Co., employing 311 men at its Butte property, announced Aug. 10 that, effective the same day, it would suspend operations because of the veto of the bill extending the premium-price plan for copper, lead and zinc. A minimum crew was to be retained to clean out stopes and for salvage operations.

★Princeton Mining & Milling Co., Granite County, has arranged to have Bob Hunthousen, of the U. S. Bureau of Mines, at Albany, Ore., supervise its diamond drilling to explore its ground at depth, according to J. W. Abbott, president.

★The Mining Association of Montana will hold its summer convention at Virginia City, Madison County, in August, 1948. W. H. Myers, Virginia City, president of U. S. Grant Mining Co., is chairman of the arrangements committee. This was announced by Carl J. Trauerman, secretary-manager at a meeting of the Madison County Mining Association, at Pony, Aug. 9. The Madison County association was addressed by Prof. O. A. Dingman, Butte, of the Montana Bureau of Mines and Geology, and John L. Boardman, Butte, Anaconda's director of safety. Mr. Boardman showed a film entitled: "Falling Ground." A one-reel picture, "The "The Story of an Ore Sample," was exhibited by John Comfort, Virginia City.

★B. H. Castle, Helena, has been elected president of the Castle Mining Co.; Harold Castle, Marysville, vice-president, and Leo Regnier, Detroit, Mich., secretary-treasurer. With Arthur Busch, Spokane, Wash.; Richard Wagner, Reardon, Wash., and Lester Wyina, Spokane, they comprise the board. The company is doing diamond drilling and is bulldozing the surface vein on the Belmont and Bald Mountain properties, at Marysville, formerly operated by the late Thomas Cruse.

★To administer a law passed by the 1947 Montana Legislature, requiring the registration of civil engineers and land surveyors, Governor Ford has appointed a board consisting of S. D. Waldorf, Bozeman; Richard J. Hale, Missoula; A. E. Adami, Butte, and John H. Morrison, Helena.

IDAHO

Bunker Hill to try block caving—District adopts higher wage scale—Day interests to merge

★Bunker Hill & Sullivan Mining & Concentrating company of Kellogg is preparing to try out a large-scale experiment on mining and milling low grade silver-lead-zinc ore based on low production cost, according to J. B. Haffner, general manager. The experiment will be under the engineering supervision of C. E. Schwab and will be tried out on a block of ground estimated to contain 5,000,000 tons of ore that will average around 3% lead and ½ oz. of silver per ton, left in the wall rocks of the mine after the higher grade ores have been removed.

The company has driven 6,000 ft. of lateral drifts through the area, which is estimated to be 1,000 ft. long, 165 ft. wide and 300 ft. deep, and which will be mined by the block caving system. Initial preparations include a central underground station costing $100,000, which will contain a crushing plant costing $36,000. The material will in so far as possible be handled by mechanical means such as tugger hoists, scrapers, conveyor belts, sink-and-float and flotation machines, combined with large tonnage operations, reducing the manpower required to the lowest unit possible. The size of the operation will be limited only to the milling capacity. At present the Bunker Hill mills handle 1,800 tons daily of the better grade ores, but the milling units are being enlarged to 2,800 tons per day to handle initial output from the caving system, and it is planned to increase the milling capacity to 5,000 tons daily.

Studies are being made of other portions of the mine, and in the old workings of the adjoining Last Chance mine for blocks of ground in which the same caving methods can be used. Mr. Schwab estimates that the block caving system will produce anywhere from 2,000 to 10,000 tons per day, or 20 to 25 tons per day per man employed, as against about 2½ tons per man under ordinary mining methods.

The new system will not interfere with Bunker Hill's high grade production, which is based on millions of tons of blocked-out ore reserves sufficient to last a number of years. The company is also sinking to deeper levels, which will make Bunker Hill the deepest mine in the Coeur d'Alene district.

★Coeur d'Alene district mining companies and different local miners' unions of the Mine, Mill & Smelter

Workers (CIO) have signed a two-year wage agreement by which the men get a raise of 12c per hour, or 96c for an 8-hour shift, retroactive to July 1, 1947. The agreement also provides for six paid holidays per year. The agreement involves some 3,000 men employed in the district. The new and old wage scales are as follows:

	Old Scale	New Scale
Miner	$ 9.73	$10.69
Mucker	9.23	10.19
Surface labor	8.98	9.94
Timberman	10.23	11.19
Timber repairman	10.48	11.44
Raise miner	10.23	11.19
Drift miner	10.23	11.19
Sinking shaftman	10.73	11.69
Main line motorman (trolley)	10.23	11.19
Main line motorman battery	10.98	11.94
Level motorman	9.73	10.69
Swamper (main line trolley)	9.73	10.69
Swamper	9.48	10.44
Cager	9.48	10.44
Mucking machineman	9.73	10.69
Trackman	9.73	10.69
Pumpman	9.48	10.44
Pipeman	9.98	10.94
Nipper and powderman	9.73	10.69
Bull gang (yard and common labor)	8.98	9.94
Mechanic, 1st class	10.48	11.44
Mechanic, 2nd class	9.98	10.94
Machinist, 1st class	10.48	11.44
Machinist, 2nd class	9.98	10.94
Electrician, 1st class	10.48	11.44
Electrician, 2nd class	9.98	10.94
Welder, 1st class	10.48	11.44
Welder, 2nd class	9.98	10.94
Blacksmith	10.48	11.44
Carpenter	10.48	11.44
Helper (all classifications)	9.48	10.44
Shaft repairman	10.73	11.69
Truck driver (heavy equipment)	9.73	10.69
Truck driver (light equipment)	9.48	10.44
Watchman	9.48	10.44
Mill Classification and Rates		
Flotation operator	9.98	10.94
Repairman	9.98	10.94
Millman	9.48	10.44
Mill labor (inside)	9.23	10.19
Repairman helper	9.48	10.44
Common labor	8.98	9.94
Sawmill Rates		
Head sawyer	10.23	11.19
Sawmill operator or helper	9.48	10.44
Sawmill labor	8.98	9.94

★All of the mining company interests controlled by the Day family in the Coeur d'Alene district are to be combined into one parent company, to be known as the Day Mines, Inc., according to Henry L. Day, of Wallace, president and manager of the companies involved.

The new company is to be incorporated for 5,000,000 shares of 10 cent par value non-assessable stock, $500,000 capitalization, out of which 2,886,575 shares will be issued to stockholders in the different companies, involving some 4000 stockholders.

Officers and directors of the new company are named as follows in a descriptive folder mailed to individual stockholders: Henry L. Day, Wallace, president; Frank M. Rothrock, Spokane, and Paul B. Jessup, Wallace, vice-presidents; S. F. Heitfeld, Wallace, secretary-treasurer, and R. W. Anno, Wallace, assistant secretary-treasurer. Eleanor Day Boyce, Wallace; Wray D. Farmin, Clarence I. Paulsen, and F. Wallace Rothrock, all of Spokane, will complete the board of directors.

The new company will own approximately 733 mining claims, three pro-

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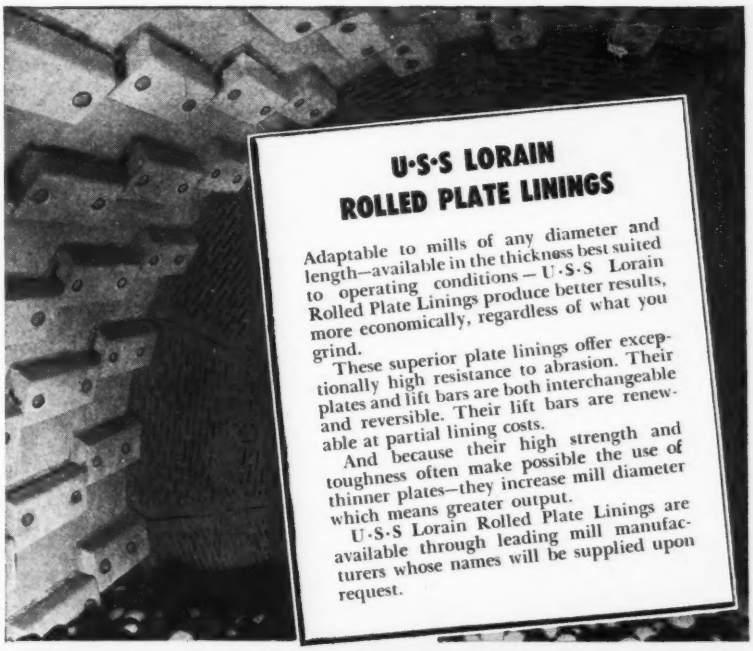

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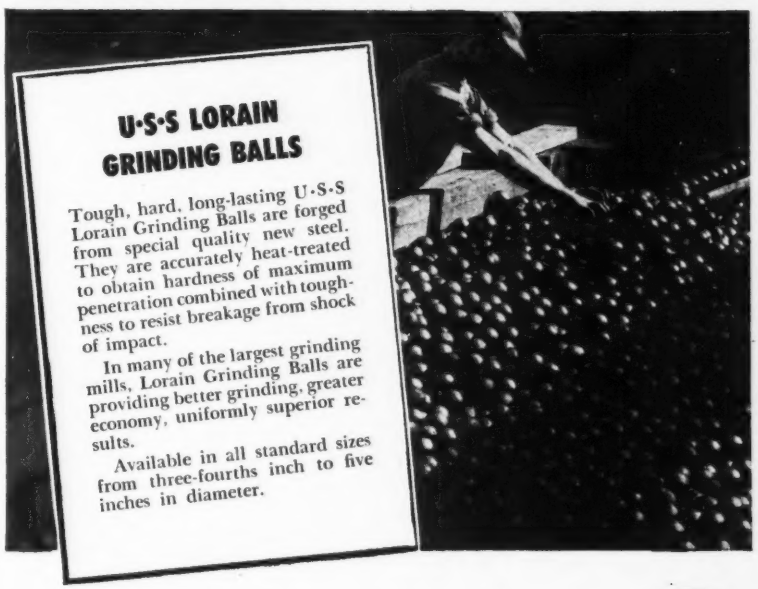

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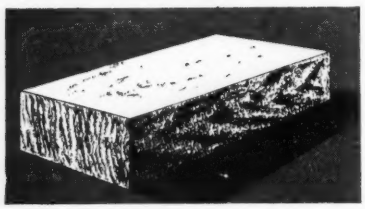

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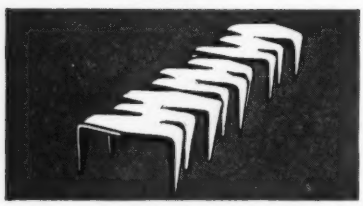

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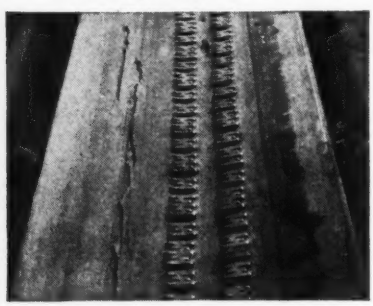

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Idaho (*Continued*)

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Day Mines, Inc., will start off with a working capital in excess of $1,400,000 and with blocked-out ore reserves sufficient to last five years at capacity operations.

Companies participating in this new consolidation are: Tamarack & Custer, Hercules, Sherman Lead, Dayrock, Monitor, King, Stanley, Duluth, Happy Day, Western Union, Crystal Lead, and Treasure Vault.

★Highland-Surprise Mining Co., operating in the Pine Creek district, announces that suspension of the zinc premium payment plan will not seriously interfere with the company's production operations, since the company realized a benefit of only one-half cent per ton above the 10½ cent market price for zinc.

★King Mining Co. is reopening the old National mine tunnel to study the vein system passing through Copper King, National and Miss-ula Copper ground. The properties are situated northeast of Mullan.

★Golconda Mining company is driving a development drift from its 1000 ft. level to explore the New Deal group of claims, on which Golconda holds an option. The work is being done on the Golconda vein and has 800 ft. to go in Golconda ground before reaching the New Deal property line. Recently this work encountered four feet wide of good grade silver-lead ore in this drift, presumably part of an ore shoot which Golconda had mined for 1,400 ft. in length on the 1,400-ft. level.

★Nabob Mining company, in the Pine Creek area, is drifting a 5000 ft. tunnel to tap the Nabob vein system at a depth of 700 ft. below the present operating levels. Three shifts are employed on this job with modern equipment for fast tunnel work.

★The mine buildings and compressor plant at the Orofino mine in the Murray district were recently destroyed by fire. The mine is under lease and bond to Dan Murphy and associates of Wallace, who drove a 700-ft. crosscut tunnel to open the mine, and have been shipping steadily to the Hercules milling plant in Wallace. Reconstruction of the destroyed buildings and plant is now under way.

★The Gold Hunter silver-lead mine at Mullan has been taken over by the Gold Hunter Mining Co. after being under lease to L. M. Norris and associates for the past 14 years. The property is now being operated by the company, with Mr. Norris in charge of the mining and milling. C. K. Cartwright is resident manager. The company is unwatering the mine down to the 1,200 level, where work was suspended during the first world war because of the low metal market and the destruction of an underground hoist by fire. The leasers operated the mine from the surface down to the 600 ft. level.

★The Whitedelf mine at Clark's Fork, largely owned by former U. S. Senator Compton I. White, reports the discovery of a body of high grade silver-lead ore in a shaft development. The orebody is reported 4½ ft. wide and assays 448.8 oz. of silver and 15.2% lead. The mine is equipped with a milling plant and has been a producer for a number of years from upper levels. The company is sinking to open up orebodies disclosed by U. S. Bureau of Mines diamond drill operations.

★American Smelting & Refining company's Vulcan shaft on Lake gulch just west of Wallace has been unwatered to the 800 level and reconditionted to 4-compartment size, and will be continued on down to the 3,000-ft. level. The Day interests are co-partners in the enterprise to the extent of one-fourth of the costs.

ALASKA

Treadwell-Yukon, in liquidation, distributes last dividend. Southeast Alaska active

★A break in the tunnel of Livengood Placers this summer threatened to empty the lake. The water level was lowered from 1,080 ft. to 1,072 ft. before a temporary dam could stop the flow. Pumps will make available the same amount of water for mining as before.

★Alaska Gold Metals Co. has brought a group of engineers and geologists to the Salt Chuck and Rush & Brown mines. Compressors, hoists, road building equipment and other supplies have also been brought in, according to A. L. Howard, manager at the Salt Chuck. Production at the Rush & Brown is scheduled to begin this year.

★Vanadium Corporation of America is reported to have purchased the chrome mine at Red Mountain, near Seldovia. The property is to be examined. The possibility of getting power from Seldovia is being investigated.

★Frank Carpenter, of San Francisco, has been in the Koyukuk area where he is interested in mining operations on the Hammond River.

★E. F. Wann and Leo Hardy left Fairbanks in August for Wann's quartz property, near Whittier, a quarter of a mile from salt water, and planned to have a crew of three at work. The mine has been taken under option from Ralph Merrill. There is a 10-ton mill.

★Ben Watson and Jack Carson are using sluice boxes and gold separat-

ing equipment in mining on the beach north of Cape Yakataga, according to Carl Killian, a prospector from that area.

★Jim Pierce, who with Jim McDonald and Charles Cravy is mining in the Manley Springs area, flew into Fairbanks to bank his second "cleanup" of the season. Both cleanups, are reported to have been about 1,000 oz.

★Treadwell Yukon Corp., in liquidation since 1942, has distributed a final dividend of 5c a share, amounting to $74,629. Total disbursements amount to $785,650. This includes the half share of Keno Hill Mining Co., valued at 15.27c a share.

★Andrew Olson, president of Goodnews Bay Mining Co., reports extensive gold prospecting at Colorado Creek this year under the direction of Winston Spencer, mining engineer.

★A variety of minerals is being produced in southeast Alaska this season, according to B. D. Stewart, Commissioner of Mines. Mr. Stewart said he is encouraged by the interest shown in resumption of mining development. He has appointed Joe Hopkins Jr., mining engineer, to be stationed at Fairbanks to give advice to new arrivals. Mr. Stewart said, "The basis of all mining is prospecting. When that ceases, the days of the mining industry will be numbered."

★U. S. Smelting, Refining & Mining Co. has signed a contract with the International Union of Mine, Mill and Smelter Workers which called for an 8c wage increase, and other concessions. It will run until July 1 next.

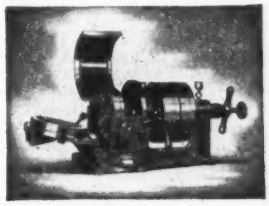
★At the Dolomi gold mine, on Prince of Wales Is., 12 men have been installing cyanide tanks the past summer, readying the 400-kw. hr. hydroelectric plant, renovating buildings, and retimbering. Start of production is expected this year. The president of the company is Robert Crowe-Swords, of Vancouver, B. C.

CANADA

Dominion gold production increases —Exploration discloses large tonnage of iron ore in Labrador

★A hoped-for increase in the gold price has been for some time a favorite topic of discussion in Canada. As an effective form of American aid, the long-rumored increase to $50 an ounce to give new life to the struggling gold-producers seems to be only an impossible cure-all. Inflation is clearly understood as the most serious threat to world economy and there seems to be no official interest just yet either in Ottawa or Washington in depreciating the dollar. Consent is required of the International Monetary Fund, under the "flexible

FOR CONTINUOUS LABORATORY SERVICE



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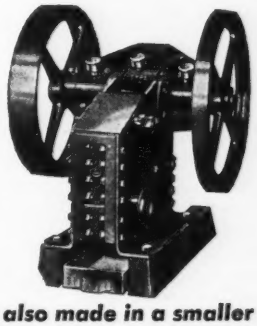

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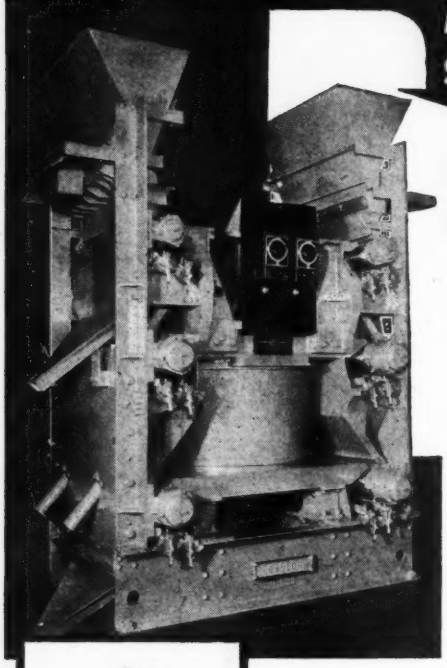

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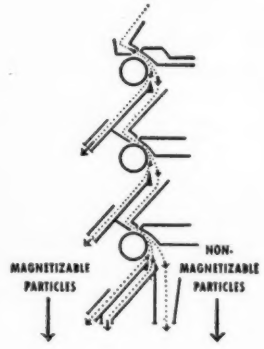

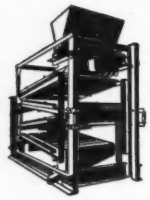

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Canada *(Continued)*

currency" provision, if it can be shown that the United States is suffering from an unfavorable trade balance. While exports continue at an all-time peak both in Canada and the United States, the chances are poor for any change in the offering price of gold. Some other form of American aid will be necessary in solving the critical British and Canadian trade problems.

★Canada in the first half of 1947 exported nonferrous minerals and their products valued at $247,810,000 compared with imports valued at $120,281,000. In the first six months imports of iron and its products amounted to $491,069,000, while exports were $227,473,000, and the value of imported nonmetallic minerals and their products was $332,611,000 against $57,361,000 for exports.

★Gold output in the Dominion for the first five months of the year amounted to 1,244,822 fine ounces compared with 1,193,862 for the same period a year ago. The Dominion Bureau of Statistics reported May production at 268,910 fine ounces, representing the following areas (totals for May, 1946, in brackets): Ontario, 176,261 (151,590); Quebec, 52,927 (54,573); British Columbia, 19,773 (15,092); Manitoba and Saskatchewan, 14,885 (17,693); Northwest Territories, 5,034 (1,173); Yukon, 30 (nil); Nova Scotia, nil (254).

★Mining metallic ores employed 33,333 wage-earners in June at an average of 97.8c per hour for 44.7 hours per week, compared with 86.2c per hour for 45.6 hours per week a year ago. In the past year wages increased from $39.31 to $43.72 per week. There were 11,276 employed in mining nonmetallic minerals (except coal) at an average weekly income of $33.97 compared with $30.24 a year ago, the rate advancing from 66.6c to 76.5c an hour in the same period. Average hourly earnings for the coal miners in the same period advanced from 95.1c to $1.15 an hour. The Dominion Bureau of Statistics index for the mining groups was about the same as at June 1 a year ago, 157.4, compared with 139.5 May 1, 1947. Payrolls in the year advanced 4.6 percent.

★Joe Scanlan, labor authority who is a member of the staff of the Massachusetts Institute of Technology, on Sept. 6 told the Maritime Labor Institute meeting at Sydney, Nova Scotia, that the steel industry of the United States may be revolutionized by the production of iron ore in Labrador. Sydney was a strategic location for the smelting of ores to be produced in the rich Labrador-Ungava district. It was stated that sites along the Atlantic coast had been acquired by American steel companies as a preliminary to establishing blast furnaces as soon as the Labrador ores became available.

★The Labrador-Ungava iron range was discussed by *The Northern Miner* of Sept. 4 in greater detail than any account yet printed. Exploratory work was said to have resulted in disclosing 50 orebodies within a district 90 miles in length, of which the combined ore length was estimated at 10 miles. Drilling amounted to 45 holes, including 4 to vertical depths exceeding 300 ft. The work is being done by 3 diamond drill rigs and 3 churn drills. Proved ore is reported at 100 million tons, with several new orebodies discovered this year. When this season's work is completed in November it is expected that ore estimates will be substantially revised upward and the enlarged scale of activity planned for 1948 gives promise of leading to final plans for railroad construction and production facilities. In September a Federal airport was opened for service near Knob Lake, 330 miles north of Seven Islands, for the use of regularly scheduled planes operated by the Canadian Pacific Airlines.

★Provincial ministers of mines at a four-day meeting held at Ingonish, N.S., reported the gold mining industry to be suffering serious difficulties which threatened to become worse. Gold output in Canada had declined from $205,000,000 to $103,000,000 since 1941, resulting from price increases for labor and materials and the withdrawal of capital from exploration and development. It was decided to confer with Federal authorities and to draw up a definite policy. Inter-departmental committees had been formed for closer cooperation with Ottawa and to work within the separate provinces.

ONTARIO

★Hon. Leslie M. Frost, Minister of Mines for Ontario, reported gold production in the first half of the year was up 10% in ore milled, 14% in gold recovery, and 3% in value compared with the same period in 1946. Production included 982,906 oz. gold and 139,676 oz. silver. The ore grade in June averaged $9.13 a ton, the highest since December last year. The Jason mine closed in June after 9 months of production, and Omega Gold Mines shut down April 30. Berens River Mines, after 6 inactive months, resumed operations in June to bring to 44 the number of active gold producers in the province.

★Lake Shore Mines reports a record since 1935 for the total length of developed ore (18,779 ft.) developed in the last fiscal year, as stated by the president, A. L. Blomfield. A satisfactory basis for development work to avoid damage from rock bursts was stated to be eight years' ore supply below the bottom level on which stoping had been started. Labor turnover was responsible for reducing the volume of ore milled by 100 tons a day as compared with 1946. Ore grade

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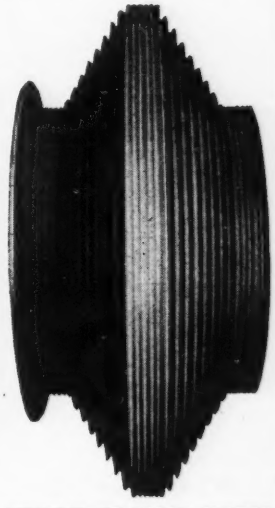

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250	255	7000 lbs.	462 ft.	Electric
255	260	6800 lbs.	422 ft.	Electric
206	215	6500 lbs.	500 ft.	28″ x 42″ Steam
207	220	6000 lbs.	500 ft.	24″ x 42″ Steam
210	225	5300 lbs.	475 ft.	24″ x 36″ Steam
214	240	6000 lbs.	365 ft.	24″ x 36″ Steam
180	193	8000 lbs.	563 ft.	26″ x 42″ Steam

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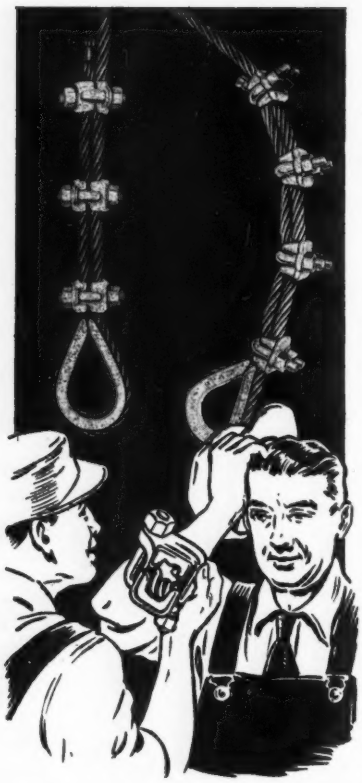

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Canada (*Continued*)

advanced from $15.05 to $15.89 per ton, giving a total production of $4,681,358 for the year. Operating costs advanced from $7.70 to $9.33 per ton. J. C. Adamson is mine superintendent.

★R. R. Brown, president of Queenston Gold Mines, reported to shareholders on progress of underground development of the property, which adjoins Upper Canada Mines. Initial production of 500 tons daily is proposed. The three-compartment production shaft is being put down to a minimum depth of 600 ft. R. J. Henry, general manager, reported on exploratory drilling and reopening of the Margaret, Murphy, and Anoki shafts and underground workings. The new No. 4 production shaft is to be connected with the Murphy and Anoki shafts, after sinking is completed next year. Diamond drilling from the old Murphy workings disclosed values up to $9.15 across a width of 47.2 ft. Present operations are handicapped by shortages of labor and materials. The temporary buildings now in use are to be replaced later by a permanent plant. Mill construction is also being delayed until conditions become more favorable.

QUEBEC

★Gold production for the province was reported by the Department of Mines at 345,367 oz. for the first seven months compared with 379,818 in the same period of 1946; silver was 1,036,833 oz., down from 1,285,235 a year ago. Important gains were recorded for clay products and lime, with cement 1.5 percent higher. Seven-month figures for asbestos show a 24% increase, following consistently high output for the last 16 months. Quebec asbestos output amounted to 367,513 tons in 1947 compared with 295,622 in the first 7 months a year ago and 280,904 in the same period of 1945.

★Important exploratory efforts in Quebec are centering around the Romaine River area, where Kennecott Copper Corporation is carrying on a large program in developing a titanium deposit; the Lake Mistassini area, where Dome Mines is participating in the preliminary work on extensive lead showings; and on the Ungava iron orebodies north of the Labrador boundary. At a distance of 90 miles northeast of Senneterre, the area around Barry Lake, Rouleau Lake, and the Macho River is attracting prospectors following gold discoveries within a wide belt of greenstone that persists through several townships. The first work in this section was done in 1935. Diamond drilling is now in progress.

★Surprise Lake, located about 35 miles north of the active Barry Lake district, has become the center of a staking rush following gold discoveries by the Vincent Mining Corporation. Pioneer Gold Mines of B. C., Dubisson Mines, and several independent prospectors are reported to be working in this district. An east-west greenstone belt intruded by syenite dikes has disclosed good values in gold and copper. This winter it is planned to diamond drill through the ice to trace continuity of the veins into the lake.

★Important gold discoveries announced in August by Anglo-Huronian Mines, located in township 604 about 90 miles north of Amos and 38 miles from the Ontario boundary, led to a staking push that covered about 25 square miles in three townships. Quartz veins intersecting diorite have been traced for short lengths by trenching through heavy overburden. For the past three summers Anglo-Huronian has kept prospecting parties at work in this area, which is accessible for planes that land on the Harricana River near the discovery. Prospectors were reported flying in from Noranda, Val d'Or, Amos, and Senneterre.

★The major public interest in any mine development since the war was developed in August after Eldona Gold Mines had intersected 153 ft. of continuous ore values in hole No. 36 drilled from the 500 ft. level. Gross value of $30 per ton represented gold-silver-copper-zinc ore. Drill holes put down from surface before shaft sinking was started had indicated ore values similar to those secured by the latest work. Plans were announced for deepening the shaft to 1,000 ft. to open up the new ore section. The property is being developed by the Chamberlin Management Corporation.

ONTARIO

★Steep Rock Iron Mines Ltd. set a new monthly high in August with shipments of 237,424 tons of high-grade iron ore from its "B" orebody. Shipments for the year to Sept. 1 total 784,626 tons. The company is planning to develop four other mines in the same area. Last year Steep Rock shipped about a million tons and this year's plans have called for shipping one and a quarter million tons.

MANITOBA

★The report of Sherritt Gordon Mines, Ltd., for the second quarter of the year reveals that 123,323 tons of ore was milled from which was produced 4,908,759 pounds of copper; 2,870 tons of zinc concentrate; 1,347 oz. gold, and 42,388 oz. of silver. Copper sales during the period exceeded production by 1,269,362 lb. Profit for the mine operation, after provision for taxation but before write-offs, was $435,667. Capital expenditures included $200,399 for exploration. At Lynn Lake the drilling of the "EL" orebody was completed indicating a total of 1,827,000 tons of ore averaging 3.28% nickel and 1.16% copper. Two new anomalies were investigated

during the period; one of which proved to be nickel-bearing sulphides lower than ore grade; the other contained only barren sulphides. Construction progress included the building of permanent camp buildings at the "EL" orebody and the building of a gravel road to connect the "A" and "EL" orebodies with the main camp at Lynn Lake. Geological mapping and surveying were carried on at the Hughes Lake and Farley Lake properties, and drills were moved from Lynn Lake to both these properties towards the close of the period. Michipicoten Iron Mines, Ltd., a company subsidiary, has had two suits filed against it by Algoma Ore Properties, Ltd. In one suit Sherritt Gordon Mines, Ltd., and Frobisher Limited are co-defendants. Both actions are being defended. Employees of the Sherritt Gordon mine went on strike August 13 demanding wage increases and claiming discrimination. This move was unexpected as negotiations between the Conciliation Board, appointed by the Dominion and Manitoba Departments of Labor, had apparently reached an agreement with the United Mine, Mill and Smelter Workers Union. The company regards the strike as illegal as the agreement with the Union embodied the Rand formula in which all affected employees must vote before action is taken. The Lynn Lake operation is not affected by the strike. Additional drilling results on the new anomaly at Lynn Lake known as "C" indicates that the axis of this anomaly has a north-south trend, and is 400 ft. in length. The company has also started to build a new winter freighting road from Sherridon to Lynn Lake via Granville Falls, the prospective power site in this area. The winter road used last year is inadequate for the heavier loads anticipated for both the power and mine sites.

★Hudson Bay Mining and Smelting Co., Ltd., announces that preparations are being made to sink a new shaft to be known as No. 4. This shaft will service the new orebody discovered in the narrows of Schist Lake, a short distance south of the old Mandy mine. The new deposit is estimated to contain 200,000 to 300,000 tons of ore similar to that in the Flin Flon mine but of higher grade. The flotation plant at the Mandy property will probably be used to concentrate the ore prior to shipment of the concentrates to the Flin Flon smelter. The company is treating 16,500 tons of zinc concentrates stockpiled at the Mandy mine since 1944. These concentrates were unacceptable to Metals Reserve Corporation, Washington, due to a high cobalt content. The company has, however, successfully treated the concentrates at the Flin Flon electrolytic zinc plant. The report of operations for the first six months of the current year discloses that 912,722 tons of ore were mined.

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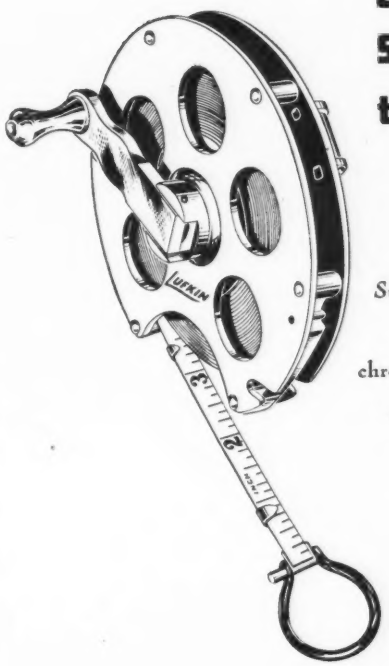

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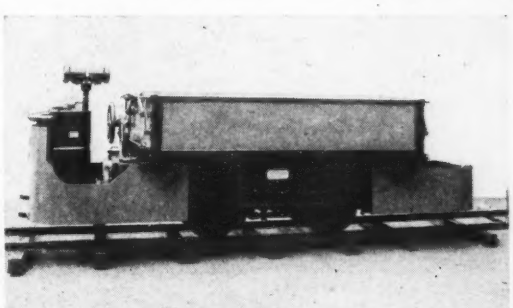

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Canada (*Continued*)

★Jacknife Gold Mines, Ltd., originally organized for exploration work in the Yellowknife area, Northwest Territories, are diamond drilling the old Poundmaker property five miles northwest of the San Antonio mine. This property was the scene of some underground development from 1922 to 1925 and again in 1934.

★ Falconbridge Nickel Mines have arranged with R. J. Jowsey and associates to diamond drill, on a 50-50 basis, a group of claims adjoining Sherritt Gordon Mines, Ltd., main group at Lynn Lake.

★Sannorm Mines, Ltd., are preparing to resume exploration of its property east of the San Antonio mine. The collar will be sunk and poured and the headframe erected. Immediate continuation of sinking operations will be dependent on an adequate power supply.

★Wekusko Consolidated, Ltd., reports interesting values being obtained in a raise from the third to the second level. Results as reported by G. B. Tribble, manager, are: 0.13 oz. of gold over 5.9 ft., 0.14 oz. over 5 ft., 0.6 oz. over 5.1 ft., 5.27 oz. over 5.3 ft., 2.85 oz. over 6.9 ft., 1.46 oz. over 1.0 ft. (balance of samples from face lost), 1.25 oz. over 5.4 ft., and 5.65 oz. over 5.1 ft. Fourteen face samples in upper seventy-five feet of raise are reported to have averaged 1.48 oz. uncut over an average width of 4.8 ft. Development will be continued to determine the horizontal and vertical dimensions of the new body. Drifting is being continued on four levels. Encouragement is also reported on the first level where a new shear has yielded good assays from preliminary samples. Gods Lake Gold Mines, Ltd., are financing the operation through the purchase of treasury shares and now holds the major interest in Wekusko Consolidated, Ltd.

BRITISH COLUMBIA

★An explosion of methane gas in the underground workings of the upper Bridge River mine of Pacific (Eastern) Mines, Ltd., Aug. 18, resulted in the deaths of Vernon S. Wright, in charge of diamond drilling for Boyles Bros. Drilling Co., Ltd., N. H. Ryan, and A. G. Geils. The first rescue attempt by special crew flown into the district by the B. C. Department of Mines failed when the concentration of gas was too great for the respiratory equipment on hand. In bringing in a verdict of accidental death the Coroner's jury found that a week-end shutdown of the mine before the accident caused a dangerous condition to develop underground and that the three men proceeded to work without proper precaution. Death was found to have resulted from a combination of concussion and carbon monoxide poisoning.

★Abolition of British Columbia's two percent mineral tax has been asked by the Mining Association of B.C. on the grounds that it represents dual taxation to the amount of one million dollars annually. It was explained by a delegation which called on the cabinet that no objection had been made before the war when payment of the mineral tax was accepted as pre-payment on provincial income tax. However, its continued imposition since all income tax has been taken over by the Dominion Government now amounts to double taxation.

★The early construction of an all-weather road to connect the mining district of Atlin, northwestern British Columbia, with the Alaska highway system is forecast by the offer of the British Columbia Government to bear half the cost (all of the cost within B. C.) if the Dominion Government will finance construction of that section within Yukon. Total cost is estimated at $400,000. The Hon. E. C. Carson, minister of public works, has asked Ottawa to undertake the supervision of the work. No start is anticipated before 1948 as no appropriation has yet been made by parliament.

★The Consolidated Mining and Smelting Company of Canada, Ltd., has purchased three of the four Kootenay river power plants of West Kootenay Power and Light Co., Ltd. They are: Upper Bonnington, rated at 84,000 hp.; South Slocum, 75,000 hp.; and Corra Linn, 57,000 hp. The company previously owned the Brilliant plant, constructed during the war with an installed capacity of 74,000 hp. and ultimate capacity of 148,000 hp. In addition it consumes approximately 80% of the rated capacity of 60,000 hp. of the Lower Bonnington plant.

★July production of Polaris-Taku Mining Co., Ltd., was 1,816 oz. gold from 7,081 tons. Extension of diamond-drill hole No. 112 on the Polaris (main) level intersected 12.5 ft. of ore of which 5.0 ft. assayed 0.2 oz. gold per ton, 4.0 ft. 0.84 oz., and 3.5 ft. 0.62 oz. The true width of the intersection has been determined at 8.0 ft. averaging 0.52 oz. per ton. Hole No. 199, also driven from the Polaris level, obtained an intersection of 5.5 ft. of ore approximately 250 ft. south of hole 112; true width is 4.0 ft. and grade 0.32 oz. The vein is thought to be the persistence of good ore found 300 ft. lower in the 357-drift. A crosscut is being driven on the Polaris level to investigate the intersections.

★A crosscut from the low-level tunnel of Morris Summit Gold Mines, Ltd., has advanced 13 ft. into the 'A' vein without reaching the hanging-wall. Diamond-drill hole No. 312, driven in advance of the crosscut, 16 ft. of ore with a value of $25.60 per ton in gold and silver. Across 12 ft. of the intersection the average was $35.00 per ton. Drifting will proceed

as soon as vein width is delivered. The company is developing the Salmon Gold mine on Summit Lake, Portland Canal mining division.

★Cementing of the portal and a part of the main tunnel of the Ecstall River property of Northern Pyrites, Ltd., is being carried out for maintenance purposes. The company is a subsidiary of Newmont Mining Corporation.

★Operation has been suspended by The Twin "J" Mines, Ltd., at its Mount Sicker copper-zinc property. Continued shortage and large turnover of labor is given by the management as the reason. The plant includes a 150-ton selective flotation mill installed in 1943 by War Metals Corporation.

★The 800-level crosscut of B.R.X. (1935) Consolidated Mines, Ltd., Bridge River valley, being driven to reach the California vein in which commercial ore was indicated by drilling, has encountered an unexpected concentration of copper, assaying as much as 3% in addition to gold and silver over widths varying from 10 in. to 3 ft.

★Pinebrayle Gold Mines, Ltd., has resumed development work on its Bridge River district property, situated across Cadwallader Creek from the Bralorne mine.

★Canadian exploration, Ltd., subsidiary of Placer Development, Ltd., is currently concentrating ore at its Emerald tungsten mine at the rate of 150 tons daily. The first shipment of tungsten concentrate was made in mid-August to England via Seattle. The mine is situated in the Nelson district and was acquired from War Assets Corporation after being fully equipped during the war with a 300-ton mill.

★June production of The Cariboo Gold Mining Co., Ltd., was 1,861 oz. gold, valued at $71,648, from 5,527 tons, averaging 0.34 oz. gold per ton. Directors have confirmed a proposed underground - development program estimated to cost $400,000.

★July production of Island Mountain Mines Co., Ltd., Cariboo district, was 1,510 oz. gold, valued at $52,839, from 3,434 tons, averaging 0.44 oz. gold per ton.

★Since its incorporation last year, Duthie Mines (1946), Ltd., has expended $141,199 in preparing its Omineca district property for production. A total zone length of 3,500 ft. with a vertical range of 1,150 ft., has been indicated by the diamond-drilling and former underground operations. The surface diamond drill intersections, all above the 3,800-ft. level, cover a length of 1,000 ft., vary below surface level from 310 ft. to 140 ft., and above the 3,800 ft. level from 230 ft. to 490 ft. respectively. The ground lying between the intersections and the 3,200-ft. level (lowest horizon), a

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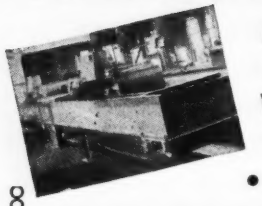

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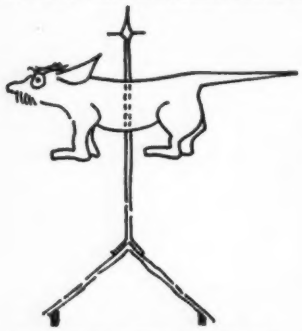

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Canada *(Continued)*

vertical distance of 770 ft., is considered favorable prospecting territory.

★The Monarch and Kicking Horse mines of Base Metals Mining Corporation, Ltd., subsidiary of The Mining Corporation of Canada, Ltd., will be re-opened in the near future for the purpose of conducting salvage operations. The properties are situated at Field in the Golden mining division.

★The 1301 North drift of Silver Standard Mines, Ltd., has been extended 100 ft. in recent driving. Three face assays during the last week of August yielded the following: 0.42 .oz. Au, 28.7 oz. Ag, 1.9% Pb, and 11.1% Zn across 2.0 ft.; 0.28 oz. Au, 2.6 oz. Ag, Trace Pb, and 5.9% Zn across 19 in.; and 0.17 oz. Au, 27.5 oz. Ag, 7.4% Pb, and 4.2% Zn across 19 in. The mine is situated at Hazelton in the Omineca district.

★Omineca Gold Quartz Mines, Ltd., has called for tenders for the driving of 1,000 ft. of tunnel to determine any persistence at depth of the promising gold-bearing veins indicated by surface work and diamond drilling at its Copper river property.

★During the first half of 1947, Highland-Bell, Ltd., Beaverdell district, received net smelter returns of $199,806 from ore shipments to the Trail smelter. Extraction of 97 oz. gold, 264,649 oz. silver, 116,620 lb. lead, and 64,465 lb. zinc was made from 2,084 tons.

★Quatsino Copper-Gold Mines, Ltd., has obtained a diamond-drill intersection of 4.0 ft. assaying 0.32 oz. gold and 10.5 oz. silver per ton at a length of 111 ft. from the shaft of its Amandy mine, Greenwood district.

★The year's production of The Yukon Consolidated Gold Corporation, Ltd., reached a value of $607,000 at the end of July and is expected to surpass that of recoveries in 1946. Unusually profitably sections of ground were encountered in July by dredge No. 8 on Middle Sulphur Creek and dredge No. 11 on Middle Hunker Creek. G. Goldthorp Hay, president, who inspected the company's operations last month, states preliminary testing has been encouraging during the season with some millions of cubic yards being added to the reserves as a result of work done on Gold Run Creek. Testing is now in progress on All Gold and Flat creeks. If sufficient labor is obtainable, two more dredges will be commissioned in 1948, which will increase the total in use to eight.

★The annual meeting of shareholders of Ymir Yankee Girl Gold Mines, Ltd., approved increase in capital from 3,000,000 to 4,000,000 shares to provide new funds for the development of placer properties in Yukon. A new tractor and gold-recovery plant have been delivered to the Ballarat Creek leases, regarding which E. P. Crawford, president, states: "A limited amount of test-pitting was accomplished during the past year and it established the pay channel to extend from Discovery claim to 24 below Discovery claim, the latter being the last line of test pits sunk. This work was discontinued owing to the excessive cost, and the difficulty of sinking pits to bedrock in wet ground but the testing will be resumed when a drill is available. Testing during the 1946 season showed that payable gravels extend for a total length of over two miles with the last pits still in good values but the width of pay channel and average values cannot be accurately stated until regular drilling is done. The Discovery claim area tested in 1941 averages $2.00 in gold per cubic yard. A start was made at stripping the moss and brush overlying the deposits. This was done on Claim 5 below Discovery, and an area 60 ft. wide and 400 ft. long was stripped. The total working costs for the season were $11,221 and equipment purchases aggregated $3,138."

MEXICO

Argument over coinage of silver—Power shortage hampers Pachuca mines—Mine employment rises

★Mexican mining has benefited considerably by the Government's action in buying Mexican silver at 70c and in coining over 40,000,000 pesos of silver one- and five-peso coins. The new coins were to begin circulating in September, and the Government has used a special plane to distribute the coins about the country. This restoration of silver money, it is hoped, will do much to bring down prices in Mexico by slackening the popular urge to turn Mexico's huge accumulation of paper money into goods. Mexico now has about 1,800,000,000 paper pesos in circulation, and prices are very high. There is another school of thought, however, that takes the view that the new silver coins will be buried in backyard hiding places as fast as they are issued. This question is being eagerly debated, but the answer should be apparent before long.

★Mining enterprises, and other operations, in the Federal District and adjoining regions were seriously hampered recently by a power shortage caused by low water behind the generating dams of the Canadian-Belgian-owned Mexican Light & Power Co. The water shortage was caused by the worst drought that has hit this region in 27 years. A 40% cut in power use was applied to all consumers by the power company, although Real del Monte at Pachuca got by with only a 25% cut because the 40% restriction would have forced the company to lay off about 5,000 workers.

★Employment in Mexico's mining industry is increasing, according to Agustin Guzman V., secretary general of the Miners' Union. About 5,000 men have recently found jobs in mines, and the Union now has a membership of 85,000, which makes it Mexico's largest union. Guzman says that the Miners' Union hopes to add 10,000 new members by an organizing drive.

All employers and employees in Mexico who work on a contract basis are interested in plans now being formed by a group in Congress to legislate a profit-sharing plan to cover all contracted workers in Mexico. Headed by Congressman Aquiles Elorduy, the group will push this action for the session of Congress that opens on Sept. 1.

★Production at the Fundidora de Fierro y Acero de Monterrey, Mexico's largest iron and steel works, is steadily decreasing because of the systematic sabotage practiced by workers in the sheet steel plant. The slow-down in this department arises out of an unsettled conflict, which the labor ministry is now trying to resolve.

★Legislation to reduce taxation on mining production will be taken up at the next session of the Mexican Congress.

CHILE

Gold miners fear monetary Board regulation—Nitrate companies plan increased output

★Coal miners at Lota, Coronel, and Lirquen have presented petitions for wage increases amounting to 800,000,000 pesos annually. If accepted, this increase would require a rise of about $6 per ton in the cost of coal, which would in turn cause increases in gas, freight, and travel rates. The petitions of Chilean coal miners have been the cause of bitter labor strife during the past two months, and they may not be settled for some time.

★The projected agreement by the International Monetary Stabilization Board would seriously jeopardize most Chilean gold mines. Most such mining companies have been supported in recent months only by the premium commanded by their gold production in markets such as Buenos Aires. The Chilean Government has been helping local miners sell their gold for the highest price it would bring; for example, Chilean 100-peso gold coins bring 1,040 paper pesos in Santiago, but over in Buenos Aires they bring over 1,200 paper pesos, and even higher in some black markets. This premium has enabled many mines to meet rising costs, and if the price for gold is held rigidly to 35 Chilean pesos per gram, this premium will be lost.

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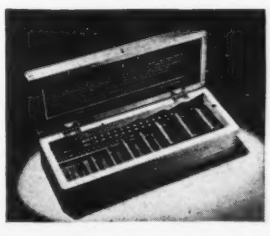

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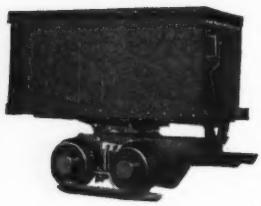

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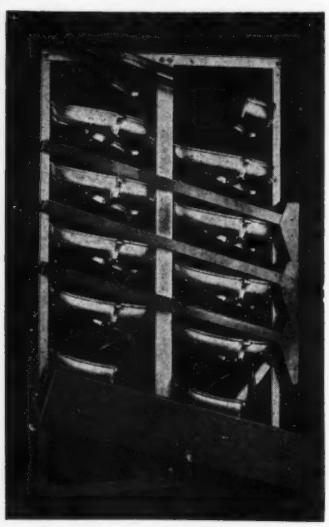

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Chile *(Continued)*

plant is negotiating with the Peruvian Government to work out an exchange of Chilean cement for Peruvian coal. The proposal of the Chilean group calls for an exchange of 3,400 tons of cement for an equal amount of coal. Outside any such agreement, Peru has already contracted for 10,000 tons of cement on a cash and carry basis.

★Despite labor unrest in the Chilean nitrate fields, the Lautaro and the Tarapaca & Antofagasta nitrate companies are planning various plant expansions for 1947-48. Current exports from Maria Elena and Pedro Valdivia total 4,000 tons monthly. These two plants, which are run in combination, recently ordered six new locomotives from General Electric Co.

COLOMBIA

Iron and steel industry planned for Boyaca—Mining laws made more liberal—Emeralds mined

★The Colombian Institute for Industrial Development, an official Government agency, is studying plans for building the first large iron and steel industry in Colombia. Such an industry would be supplied with iron ore from the deposits at Paz del Rio in Boyaca, which run about 45% iron, 10% silica, 1% phosphorous, and less than 0.05% sulphur. Coke and limestone are available within a radius of a few miles. A rail and highway connection must be built between Paz del Rio and the rest of the country. The project should take about three years to complete. Plans call for an initial production rate of 100,000 tons of pig iron yearly, and the first capital investment would amount to $28,571,000.

★Because of the recent accident in which 17 miners were killed at the Tocaima coal mines in Cundinamarca, the ministries of labor and of mining are preparing new legislation to regulate Colombian coal mining in line with similar safety regulations in the United States and Great Britain. One difficulty is the probability that such safety rulings would still further curtail a lagging coal output. Colombian coal comes largely from Tertiary beds, and only at Tocaima in low-lying country are toxic gases a danger. High hopes are held for development of Colombia as a coal producing and exporting nation.

★Aside from the gold and platinum dredges which for many years have worked the placer deposits near Pato in Antioquia and in the Choco, there are now four additional dredges working in Colombia. These are: Two dredges on the upper Cauca River at Asnazu, operated by Asnazu Gold Dredging, Ltd.; one dredge on the Patia River, operated by Aluviones Selectos, S. A., a Newmont affiliate; and one dredge on the Telembi River, operated by Cia. Minera de Narino. Other placer areas have been, or are being, prospected along the upper Magdalena River, the Saldana River, and the lower Cauca.

★In Colombia there are at present two sets of laws that control mining operations. Under the first are included all individually-owned or company-operated precious metal mines or placer workings located near navigable rivers. The second group of laws covers operation of non-precious metal mines located on Government-owned land, or having land rights dated prior to 1873. Operation of the latter class of mines must be contracted for with the Government, which receives a 5% royalty on mining profits. The ministry of mines is the official entity that passes on all mining concessions. The Government's decree of this year, No. 805, is designed to make it easier for mining companies to operate in Colombia and to expand their operations. Minister of mines, Tulio Enrique Tascon, recently told Congress that the Colombian mining industry faced a crisis brought about by a combination of rising costs, increased social security benefits required of it, and difficulty of obtaining equipment and supplies. The new decree, he said, was to offset some of these troubles.

★In the non-metallic field, several developments are in progress. Cia. de Barita, Ltda., has been selling barite to Shell Oil Co. of Colombia from its quarries and mills located at Chiriguana in Magdalena. The Cia. Cementos del Caribe will begin large-scale production of cement next year, using limestone mined on the Caribbean coast. Other cement plants located in the interior are producing about 1,000 tons per month. Gypsum is still imported, but several local deposits are being surveyed. Small-scale mining of sulphur is in progress in Tolima and Cundinamarca.

★Emerald mining at Muzo and Chivor will be resumed shortly. The contract for exploiting these deposits was recently granted by the ministry of mines to the Banco del Republico. The Bank in turn has contracted for mining the emeralds, as well as for classifying and cutting those stones already in possession of the Mint at Bogota. The Bank may also engage in selling beryl, which is associated with the emeralds.

BOLIVIA

Strikes, low output, disrupt mining industry and endanger economy of entire country

★ The mining industry in Bolivia has been seriously upset in recent months by a drive on the part of labor unions

to get substantial improvement in wages and working conditions. Frequent strikes, high costs, and low productivity have combined to close at least three mines: Oploca, one of the biggest tin mines in Bolivia; San Jose, which the Government has hopes of running on its own responsibility; and more recently, Araca was closed, although the Government is not yet satisfied that this last shutdown was necessary.

To cope with the present impossible situation, Patino Mines & Enterprises has proposed a plan of operations, which, in brief, runs as follows: 1. production must be increased; 2. labor unions must confine their acts to those authorized by law; 3. plant authority must be returned to management; 4. wages should be related to effective work; 5. labor unions must keep out of politics and civic order must be restored. Patino suggests that to bring this plan about it will be necessary to pay off all employees, with suitable indemnification, then terminate all obligations of the company, then hire complete new crews and start all over on a reorganized basis. The Government is considering a modified form of this plan as a compromise, because labor unions are not in favor of the idea.

★ A report, recently published, by an American technician on present conditions in Bolivian mines is of interest. It runs:

"In all the country, costs of operation have risen, and the maintenance of efficiency has been a very difficult problem. The reason for this situation is obvious; the labor unions are actually running the plants. Five men do the work of one. There is no supervision by straw bosses because the labor unions always arrange to get the bosses fired. I have worked in many countries, but I have never seen such well-organized loafing as during the last six months or a year in Bolivia. In my opinion, there is a deliberate and well-organized campaign on foot to cut efficiency of work, especially in the branches of construction and maintenance.

"Robbery is customary and is increasing in all the plants. Watchmen are in the hands of the unions, and they can not offer any protection to the property.

"Managers are forced to accept practically every demand of the workers, simply because they are threatened with violence if the demands are refused. The authorities offer no help in maintaining law and order."

This last statement, at least, is contradicted by the Government, which points out that for several weeks past, the Army has had troops in the various mining centers to keep down riots arising out of labor disputes. For example, troops were sent to Potosi after a group of mine workers there had broken into dynamite stores, driven out the management, and terrorized the town for three days. The Army restored order, but

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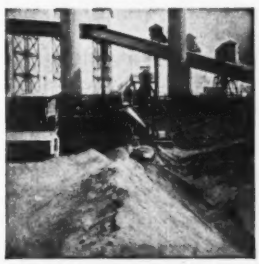

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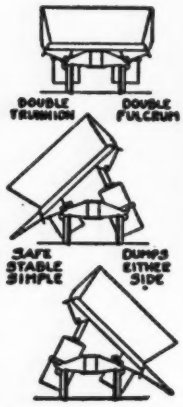

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Bolivia (*Continued*)

at a cost of 25 persons killed and some 200 injured. Riots at other mining towns, such as Catavi, have caused much trouble, but with less serious results.

★ The President of Bolivia, Dr. Enrique Hertzog, in a recent press conference, declared that reserves in dollars to import consumer goods are decreasing due "to sabotage by the mine workers against tin production." He added that the Government is backed up by the law, and will energetically pursue every legal means to end the strife and get mines into production. The countersign of today, he went on, is increased mine production, and only by following this countersign can Bolivia maintain the standard of living of its people."

Owners of small mines can not increase production because they require help to keep operating, which they have obtained in the past from the Banco Minero. This bank, created to help small miners, no longer has funds, and President Hertzog recently asked Congress to appropriate Bs. 25,000,000 to get the Banco Minero going again. (Present official exchange rate is Bs. 42.42 to the dollar.)

★President Hertzog has also announced that lead output is in very good condition in Bolivia. Officially it is known that the Government has received an "interesting" proposition from France, which offers to send technicians and a fund of $500,000 to increase output of lead. The largest known lead orebody is the Matilda property of the Hochschild interests near Lake Titicaca. This organization also is prospecting other high grade galena orebodies further south.

AUSTRALIA

Gold mines' problems increase—Coal shortage acute—Mt. Morgan improves—Broken Hill explores

★Amendments to the National Security Regulations on minerals recently announced, empower the Federal Government to acquire minerals compulsorily but against compensation. Uranium is covered by these regulations, but Government spokesmen explain that the motive right now is principally to obtain mica, which has been in acutely short supply. The Alice Springs district in the Northern Territory supplies 96% of mica mined in Australia, and most of this comes from Hart's Range, where intermittent mining has been reported since 1892. The Allied Works Council made considerable improvement in mining and transport facilities in the region during the war. Most of the mines are shallow underground operations.

★Speaking at the annual meeting of Australian Gold Development, N. L., T. R. Victor, consulting engineer, explained to shareholders the reason back of the abandonment of a projected airborne prospecting trip in Central Australia. Mr. Victor said that much of the flying, presumably using an airborne magnetometer, would have had to be made at an altitude of 100 ft., which the Civil Aviation Department refuses to permit, preferring to keep conventional airplanes at better than 500-ft. altitudes. A helicopter was considered, but price of the machine was quoted at $41,000 plus $5,000 for training a pilot. A staff of five would have been required to service the helicopter, and the total cost of such a venture was regarded as prohibitive.

WESTERN AUSTRALIA

Sons of Gwalia mine at Leonora, 150 miles north of Kalgoorlie, continues satisfactory deep development, which has reached a depth of more than 5,000 ft. along the 42-deg. dip of orebody. An internal shaft is being sunk to open up new orebodies to the south. Although revenues increased last year by 31%, costs were up 39%, and a still further advance in costs is certain when the new award to the miners' union becomes operative. In a recent month the mill treated 7,578 tons of ore, from which 1,760 fine oz. of gold was recovered. The company's policy is aimed now at intensified development to overtake the arrears resulting from the difficulties of the war years.

★Great Boulder Proprietary Gold Mines, Ltd., the second largest mine in the Kalgoorlie field, has substantially increased its output. Gold recovery from 382,984 tons of ore was 88,556 oz. in the last financial year, against 71,562 oz. from 307,312 tons last year. Ore reserves are estimated at 2,448,808 tons averaging 5.4 dwt. gold per ton.

★Operating results of these two companies emphasize the great efforts required of gold mining companies to counteract rising costs and the fixed price of their product. Agitation for a higher gold price is steadily increasing. Besides troubles such as higher wages, increased social benefits, and higher material and supply costs, mines also have to face a slowdown on the part of miners that is increasingly apparent and which seems to be deliberate. This work-limitation is being imposed despite efforts on the part of the companies to improve working conditions through use of mechanical, work-saving machines. Output is declining and absenteeism is increasing. Profit-sharing, as effected by bonuses varying with metal price, have even failed to achieve higher output at certain mines, notably at the lead-zinc properties of Broken Hill, New South Wales. At present, the lead bonus paid here amounts to £A8-15-0 per em-

ployee per week, but it has been found that the higher the lead bonus rises, the less is the output per manshift, whether the employee is working on wages on contract or not. Minimum wage at Broken Hill is now between £A14 and £A15 per week.

QUEENSLAND

★Results at Mt. Morgan, Ltd., have improved considerably in output, grade of ore, and profit. The open cut is now being operated to a depth of 650 ft. The ore is passed to an underground crushing station, then hoisted to surface up an inclined shaft. Electric shovels (2½-yd.), bulldozers, and trucks are used to transport ore. Trucking the ore to the underground crusher is one of the two examples in Australia where diesel engines are operated underground. In a recent month 67,200 tons of ore was treated; assays averaged 3.20 dwt. gold per ton and 0.39% copper. Metal recoveries were 7,453 oz. gold and 207 tons of copper.

Gold mines on the Cape York Peninsula are still in the postwar stage of re-equipment. Recovery in other gold fields has been satisfactory. Golden Plateau, N. L., operating at Cracow, won 500 oz. more in 1946-47 than in the preceding year, but tonnage treated and gold recovered still run only about one-quarter of prewar production.

NEW SOUTH WALES

★Some measure of the serious position of the mining industry in Australia, and of industry generally, can be taken from the position of the steel industry. Broken Hill Pty., Ltd., at Newcastle, and Australian Iron & Steel, Ltd., at Port Kembla, supply the country's steel requirements, yet production at these plants has been well below top capacity for some time. Stocks are at the lowest level in 33 years, and steel orders are 12 months behind in production and delivery. This lag is due primarily to a coal shortage brought about by a series of labor disputes, and by a slow-down on the part of the workers. The working week in the collieries is five days, but it is doubtful if productive time adds up to more than four days. The union will only permit one working shift per day. The situation is aggravated by refusal of a section of the ironworkers' union to abide by a recent arbitration award under which they received material benefits. In regard to coal, Australia is living merely from day to day.

★Broken Hill Corporation, Ltd., subsidiary of Zinc Corporation, is carrying on extensive exploration work in the Broken Hill district, as well as in other parts of New South Wales, Queensland, Western Australia, and the Northern Territory. M. A. Mawby has been released by Broken Hill Associated Smelters to act as director of exploration and research. Dr. Oscar Weiss, South African geophysicist, is in charge of geological work at Broken Hill. Dr. John Gustafson, of Newmont Mining Co., is visiting for six months in a consulting capacity.

VICTORIA

★A report by the Victoria Chamber of Mines indicates that shortage of skilled labor continues to retard recovery of gold mining in the State. The 42 lode mines in Victoria now employ 1,282 men, compared with 643 in 1945-46. The Chamber suggests that skilled miners, particularly the Cornishmen of the type that played such an important part in developing Australian mining, should be urged to come to Australia to work. Gold production in Victoria for the first six months of 1947 was 37,718 oz., an increase of 821 oz. over the first half of 1946.

TASMANIA

★Zinc output at the Risdon works of Electrolytic Zinc Co. of Australia, Ltd., declined from 80,458 tons in 1945-46 to 70,314 tons in 1946-47. The drop is due to shipping difficulties in moving concentrate and calcine from the Port Pirie smelter. Output from the company's west coast mines (Tasmania) showed a slight increase.

★Mining operations at Mount Bischoff, now controlled by the State Government, are said to be disappointing. The yield has been only 0.4% tin in the ore mined. Once claimed to be the world's biggest tin producer, the Mount Bischoff company closed down over two years ago after 70 years of operation. The Government then took over and put in a new plant that doubled recovery from 32% to 60%, but the objective of ore assaying at least 0.8% tin has not been attained.

★During the three months ended June 30, Mount Lyell Mining & Railway Co., Ltd., showed a distinct improvement, although ore tonnage handled was smaller than in the previous quarter. Mount Lyell's mechanization program is lagging because of delays in equipment deliveries.

AFRICA

Progress on Far West Rand—Langlaagte to resume—Rand working costs holding own

★Good progress is being made on the new mines of the Far West Rand. During the quarter ending June 30, 1947, the most recent of these mines, Doornfontein G. M., reports that preliminary work has commenced on the property and initial water and electric supplies have been established. Sinking of the first shaft (the Annan shaft) began near the end of the quarter.

★At West Driefontein, on the Far West Rand, sinking of the No. 1 shaft

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Africa *(Continued)*

goes on through unstable ground that requires consolidation by cementation. This shaft was sunk 103 ft. during the quarter to a total depth of 1,242 ft. The platform hoist is installed; the mechanical portion of the left-hand A-C hoist is erected, and the brick work of the winder house is nearly complete.

★Western Holdings has announced the results of two deflections of the drill hole on the Blinkpoort farm, Friedesheim, which is located 5,700 ft. southeast of the famous Geduld No. 1, and 4,500 ft. south-southwest of Geduld No. 2. In its original intersection of the Basal Reef, the hole yielded an incomplete core assaying 6.3 dwt over 27 in. Depth was 4,133 ft. A first deflection cut the Basal Reef with an incomplete core assaying 5.47 dwt. over 27 in. A second deflection cut the Reef at 4,130 ft. with complete recovery of a core assaying 18.47 dwt. over 21¼ in., equaling 392 in.-dwt.

★A section of the Langlaagte Estate gold mine will soon be worked again, following purchase by a new concern of about 130 claims from the liquidators of the old company. The new company, Mayfair Gold Mining Co., Ltd., will operate with a staff of about 50 Europeans and 250 natives. Work will begin at a rate of about 50,000 tons a year in a section of the Langlaagte mine that was closed down a few years after the first World War.

★The latest statement on working costs of the Rand gold mines to come from the Transvaal Chamber of Mines indicates that costs have not risen in May, June, or July. Costs per ton milled totaled 25s. 7d. in May and June, and shrank slightly to 25s. 6d. in July. A certain amount of optimism is felt in financial circles in regard to Rand working costs, mostly because many observers feel that prices, particularly of equipment and supplies from the States, are due for a cut before long.

★Gold Coast mines have recently been negotiating new contracts with their laborers. The Gold Coast Government has raised wages for day laborers on Government payrolls, and the United Africa Co. did likewise. However, the Government made the raise retroactive to Jan. 1, 1946, and the mines do not feel up to paying this much in back pay. The latest report was that the companies had offered a higher minimum wage than the Government's, but without the retroactive feature. The minimum wage now for unskilled labor is 2s. 6d. daily ($0.50).

★Bibiani (1927) Gold Mines, Ltd., reports that a Tournapull and Carryall combination that recently arrived at the mine have been of great help in building a water reservoir to hold 60,000,000 gallons.